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In the Supreme Court of the United States

OCTOBER TERM 1934.

No. 221.

UNITED STATES OF AMERICA, INTERSTATE COMMERCE COMMISSION, *et al.*,
Appellants,

v.

THE BALTIMORE & OHIO RAILROAD COMPANY, *et al.*,
Appellees.

BRIEF OF A. JOHNSTON, GRAND CHIEF ENGINEER OF THE BROTHERHOOD OF LOCOMOTIVE ENGINEERS, AND D. B. ROBERTSON, PRESIDENT OF THE BROTHERHOOD OF LOCOMOTIVE FIREMEN AND ENGINEMEN.

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November 27, 1934.

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APPEAL FROM THE DISTRICT COURT OF THE UNITED STATES FOR THE NORTHERN DISTRICT OF OHIO, EASTERN DIVISION.

BRIEF OF A. JOHNSTON, GRAND CHIEF ENGINEER OF THE BROTHERHOOD OF LOCOMOTIVE ENGINEERS, AND D. B. ROBERTSON, PRESIDENT OF THE BROTHERHOOD OF LOCOMOTIVE FIREMEN AND ENGINEMEN.

STATEMENT.

The appellants, A. Johnston and D. B. Robertson, who are the chief executives respectively of the Brotherhood of Locomotive Engineers and the Brotherhood of Locomotive Firemen and Enginemen, were the complainants in the proceedings before the Interstate Commerce Commission which gave rise to this case. By order of the District Court (R. 69), they were granted leave to intervene in this cause and were made parties thereto.

We have carefully examined the statement contained in the brief of the United States and Interstate Commerce Commission setting forth, (a) the references to the reports

of the opinions delivered by the court below and the Commission; (b) the grounds upon which the jurisdiction of this Court is invoked; (c) questions; (d) statutes involved; (e) the statement of the case, including the nature of the appeal, the Commission's order, and the material matters shown in the proceedings before the Commission; (f) the action taken in the lower court; and (g) the specification of errors. We find such statement concise and correct, and with the view of relieving the Court of the labor of reading additional matter, which if set forth here, would be duplication, we respectfully ask leave to adopt the statement contained in the Government brief upon these subjects the same as though fully set forth herein.

SUMMARY OF ARGUMENT.

I. THE COMMISSION'S ORDER WAS WITHIN THE SCOPE OF ITS AUTHORITY.

Power reverse gear is a safety device within the meaning of Section 2 of the Boiler Inspection Act, as amended. Its use substantially eliminates the numerous and severe injuries directly occurring to enginemen from handling manual reverse gear while operating locomotives and trains. By relieving enginemen of the excessive physical effort required in the use of manual gear, and freeing them of mental strain and the apprehension of injury, power reverse gear better enables them to perform their manifold duties, thereby promoting their own safety and that of the traveling public. *Napier v. Atlantic Coast Line,* 272 U. S. 605, 611.

The Commission had authority to entertain and act upon an application of employees seeking an amendment of inadequate rules and regulations promulgated under the Boiler Inspection Act, upon complaint, answers, and full hearing. *Napier* case, *supra.*

The Commission had authority, under the Boiler Inspection Act, apart from requests of the carriers, to modify or amend the existing code of rules and regulations in the interest of promoting safety. The Act contemplates that safety in operation is a relative and progressive matter, and that new devices, shown to promote safety beyond the degree recognized when the first set of said rules were promulgated in 1911 with respect to locomotive boilers, and in 1915 with respect to other parts and appurtenances of the locomotive, may be required by an amendment of the existing rules.

The Act places compulsion upon the carriers to use only such locomotives as are in proper condition and safe to operate without unnecessary peril. If, as the carriers contend, the rules may be changed only upon their own initiative, then the incongruous result is that the Act requires the carriers to compel themselves to eliminate unnecessary peril.

The Act, being remedial in nature, should be construed so as to effectuate its obvious purpose. *Johnson v. Southern Pac. Co.*, 196 U. S. 1. It was enacted to promote the safety of employees. *B. & O. R. R. v. Groeger*, 266 U. S. 521, 528. To deprive the employees of the benefits of newly developed safety devices would contravene the intent and purpose of the Act.

As declared by this Court, the Act confers upon the Commission the duty to prescribe the rules and regulations by which fitness for service shall be determined, and to require specific devices in connection therewith. Its power to grant relief from inadequate rules is ample, and includes the right to act upon application of employees, as was done here. *Napier* case, *supra*, pages 612, 613.

II. THE COURT ERRED IN HOLDING THAT IN ITS CONSIDERATION OF THE CASE AND THE MAKING OF ITS REPORT AND ORDER THE COMMISSION ACTED ARBITRARILY AND UNLAWFULLY,

in that it failed and refused to give consideration or legal effect to important material facts established before it by evidence substantially uncontradicted; ignored and disregarded the indisputable character of such evidence; and reached conclusions contrary thereto and unsupported by any substantial evidence.

The several findings of fact upon which said conclusion of the court are based are erroneous, as will be shown in detail in our argument upon this point. The evidence alluded to by the court as being substantially uncontradicted, is, in point of fact, contradicted by substantial evidence and the inferences properly to be drawn therefrom. The Commission did not ignore or disregard the indisputable character of the evidence, but rationally differentiated between that which was significant and that which was not. The conclusions of the Commission are amply supported by substantial evidence.

The court weighed the conflicting evidence, misconstrued the import thereof, and the conclusions which the Commission drew therefrom, and, without warrant, substituted its own reasoning and judgment for that of the Commission in respect of the following and other facts:

The use of power reverse gears has practically eliminated accidents to enginemen from operating the manual lever or wheel in the cab.

As to other types of injuries, occurring on power reverse locomotives, in which an employee was caught and injured in the valve motion, when some one in the cab reversed the locomotive, the record shows that the type of

reversing gear, whether manual or power, makes no appreciable difference in the happening of such accidents. The contention of the carriers that such accidents are avoidable by the use of manual gears, in that the presence of an obstruction, such as the arm or head of a man in the valve motion, can be detected by the resistance offered to the movement of the hand lever or wheel in time to avoid injury, is unsound and unsupported by credible evidence, as was found by the Commission. Such injuries, as well as those occurring to engineers and others who have their hands or arms caught in the valve motion when, due to the starting of the air compressors, the power gear normally adjusts itself, causing the valve motion to move, are avoidable by the enforcement of operating rules and practices and the exercise of ordinary care on the part of employees, which is not true of the aforementioned manual gear accidents.

The occasion for using the hand gear as a brake in case of emergency, when air pressure is not available on the locomotive, is rare (since loss of air automatically applies the brakes on the entire train), and relates only to cases in which the locomotive is running "light", i.e., without cars attached. The use of the manual lever for such purpose is often ineffective, and, moreover, is dangerous, in that the engineer is likely to be thrown and injured in thus attempting to reverse the locomotive.

Installation of properly applied and maintained auxiliary steam connections to power gears enables the engineer to reverse the locomotive under such circumstances more effectively than with hand gear.

Both hand and power reversed locomotives sometimes move unexpectedly into roundhouse walls or turntable pits. No casualties of this sort on power reverse engines were shown since 1916. Such accidents are preventable by the equipment of power gears with a device

which indicates whether the gear has responded to the movement of the control lever, and by the observation of proper operating rules and the exercise of ordinary care on the part of employees.

The use of hand reverse gear substantially interferes with the observation of signals and keeping a lookout. It is necessary for the engineer to leave his position at the window and come inside the cab in order to operate manual gear. When engaged in switching, this requires him to take his attention from the signal men and a missed signal may cause injury to someone. While "hooking up" or "dropping down" the manual gear the attention of the engineer is taken from his lookout for a period from perhaps half a minute to a minute or more, during which time the train will run a considerable distance. The engineer can operate power gear from the seat box, and at the same time keep his lookout.

The "creeping" of the power gear (which relates to occasions, when the locomotive is running over the road, in which the power reverse piston creeps slowly backward and forward, without the operating lever in the cab having been adjusted), causes no injury. The extent of "creeping" was greatly exaggerated by the carrier witnesses, and it was shown that if power gears are properly maintained "creeping," to any material extent, will be eliminated. On the other hand, proper maintenance of manual gears does not eliminate the danger of operating the same, for breakage in the various parts of the valve motion or valves, dry valves, uneven track, or high speed, will unexpectedly pull the lever out of the quadrant, and sometimes the lever "jumps" out of its notch without any apparent cause. When handling manual gear, such conditions met with in actual operation as dry valves, or steam in the cylinders, remain a source of peril even when the reversing gear is in good condition.

The oral evidence relating to manual gear accidents shows illustrative cases of fractured bones and joints, hernias, torn or sprained ligaments, contusions and cuts, in some instances severe enough to retire the engineer from service, and in others rendering it impossible for him thereafter to operate the manual gear. Such evidence did not purport to exhaust the total of manual reverse casualties, and was substantially limited to the last five years. The showing of accidents attributed by the carriers to power gears covered a period more than fifteen years. Of the nine fatalities shown on power geared engines, six occurred in the period between 1916 and 1923. The manual reverse injuries shown in both the oral and documentary evidence were directly caused by the handling of the gear, while the engineer was operating his locomotive or train, charged with numerous responsibilities in connection therewith, and happened under circumstances such as to show that he usually had no way of effectively guarding against injury. On the other hand, the accidents, including fatalities, shown in connection with power reverse locomotives, were either not attributable to the type of gear employed, or were only remotely connected with the operation of the reversing gear, and, in any event, were of a class preventable by the enforcement of proper operating rules and the exercise of ordinary care by employees.

While it is true that most of the 25,000 locomotives now equipped with power gears are the larger and heavier engines, with wide fire boxes, the carriers have also equipped a substantial number of smaller and lighter locomotives with such gear. There remain still equipped with manual gears a substantial number of their larger locomotives of the same size and weight as those generally equipped with power gears. On some roads nearly 100% of the locomotives subject to the requirements of the Commission's order have been equipped with power gears, while on other

roads the percentage is much lower. Lack of proper clearance around the manual lever was a sufficient reason to lead the Illinois Central to equip with power gears practically all of its locomotives within the weight limits of the Commission's order.

Any attempt to obtain safe clearance on locomotives equipped with manual levers by relocating the quadrant or the pipes and appurtenances in the cab would be futile. Of necessity the lever must be placed near the engineer to enable him to operate it conveniently. Wherever the lever is located, the fact remains that the space in which he must work while operating the locomotive, and while in his usual and proper position in the cab, is exceedingly limited.

Considering that less than 3% of the locomotives involved in this proceeding are equipped with manual screw gears, it is to be expected that the fewest accidents should occur from its use. While this type of gear does not "jump out of the quadrant," the difficulty in handling it is substantially the same as, or greater than, handling the manual lever, and the danger in its use lies in the fact that the control wheel in the cab is directly connected to the valve gear and valves. Disabling abdominal injuries and other strains are shown to result from the handling of manual screw gear.

A number of the injuries and much of the trouble shown with respect to power reversed engines occurred with obsolete or older types of gear, or those not equipped with the auxiliary steam connection required by the Commission's rule.

The record showns illustrative instances of requests by employees upon the carriers for the equipment of manually reversed locomotives with power gears. The Chief Inspector of the Bureau of Locomotive Inspection has repeatedly recommended that a rule requiring power reverse be adopted by the Commission.

The Commission gave full and considerate attention to the financial condition of the carriers, and drew its order so as to provide exemption from the requirements thereof of the older and lighter locomotives, as to which there was less need for the use of power gears on account of clearance conditions and other reasons.

III. THE COMMISSION'S ORDER WAS SUPPORTED BY SUBSTANTIAL EVIDENCE.

The evidence shows a large volume of serious accidents directly resulting from the operation of manual gears which can be practically eliminated by the use of power gears.

The dangers flowing from the use of manual gears are produced both by the design and construction of the gear, and by various conditions met with in practical operation. On manually equipped locomotives the engineer, or other person operating the locomotive, is required to move the various parts of the reverse gear, valve motion and valves, which weigh approximately 2000 pounds, by physical effort exerted on the reverse lever or wheel in the cab. Friction between these parts makes it necessary that excessive force be exerted in order to move the gear. The force is increased under various circumstances frequently encountered, such as steam in the steam chests and cylinders, or dry valves, and also varies with speed and the tractive effort being developed by the locomotive. Since the force required to operate a power gear is supplied by air or steam pressure, this device requires little strength to operate, and no difficulty is encountered under the circumstances just described.

In adjusting the cut-off (called "hooking up" or "dropping down" the gear) with the locomotive running over the line of road, the engineer is subjected to excessive strain directly communicated to the manual lever or wheel

in the cab from the rapidly reciprocating parts of the valve motion, and he is frequently jerked and thrown in the necessary act of handling the gear. At times excessive strain is thrown on the manual lever from various derangements in the valves, valve motion or other parts of the reversing gear, causing the lever to "jump out of the quadrant," and go to the corner of the quadrant, or whip back and forth over the length of the quadrant, frequently striking and severely injuring the engineer. When power reverse gear is used the reach-rod, which connects the reciprocating parts of the valve motion to the reversing gear, terminates at the power reverse cylinder outside the cab, and the only connection thereto in the cab is the rod operating the air valve on the air cylinder. In the event of any derangement, improper action or breakage of the parts aforementioned, the control lever in the cab, which is only eight or ten inches in height, remains seated in the quadrant, the stresses or shock from the action of the valve motion or valves being absorbed by the cushioning effect of the air-filled power reverse cylinder.

The severity of injuries sustained by enginemen while actually handling the manual lever or wheel is shown by illustrative cases of fractured arms, legs, knees, etc., internal injuries, hernias, and disabling sprains or torn ligaments, resulting, in some cases, in the retirement of the injured man from railroad service, and in some other cases in his inability thereafter to operate a locomotive equipped with manual gear.

Chief among the causes for such accidents are failures due to breakage of the parts of the valves or valve gear, lack of lubrication, the presence on the parts of the reversing gear of frost, ice or snow, or steam in the cylinders.

Such accidents are likewise attributable to close clearances around the manual lever, resulting in the engineer being caught between the lever and the seat box or other parts

of the cab, the boiler head, or the various pipes and appurtenances in proximity thereto. The space in which the engineer must work while operating the locomotive, and while in his usual and proper position in the cab, is quite limited, especially on the larger locomotives. On such locomotives many instances are shown in which the engineer was struck and injured by the manual lever when it unexpectedly "jumped out of the quadrant," or while handling the lever was thrown against the cab, boiler head or the various pipes or appurtenances in the cab.

In actual operation, with the varied and frequent movements which the engineer is required to make in order to perform his duties properly, it cannot reasonably be expected that he can constantly keep clear of the manual reverse lever, and under many circumstances he has no way of effectively guarding against injury therefrom. There is no clearance problem when power reverse is used.

The opportunity for the happening of such injuries is shown, in part, by the frequency with which engineers are required to handle the reverse gear. In switching service it is common for the reverse gear to be moved from thirty to sixty times an hour, while in road service the gear, while moved less frequently, is moved many times from station to station in adjusting the cut-off.

Most of the accidents recorded as due to hand reverse gears occurred to employees while handling the reverse gear, whereas, only a small percentage of the accidents attributed to power gears occurred to the man operating the reverse gear, the others having occurred to persons on, around or in the path of the moving locomotive.

The record shows that during the five year period from 1925 to 1929 inclusive, there were 1116 casualties to enginemen in the cab directly due to operating the reverse gear. The proportion of such casualties occurring on loco-

motives equipped with hand gears is illustrated by the fact that of 232 such cases occurring in 1929 and 1930, a total of 219 occurred on locomotives equipped with hand gears and 12 on locomotives equipped with power gears. Giving effect to this proportion, it would appear that there were approximately 1050 such manual reverse casualties during said five year period. The accidents of other types to persons on, around or in the path of power reverse locomotives were either not attributable to the gear at all (as in the cases of men caught in the valve motion of a locomotive when another employee reversed the engine) or happened under circumstances such as to show that the power gear was involved only indirectly or remotely. Such last mentioned class of casualties were shown to be readily avoidable by the enforcement of proper operating rules and the exercise of usual or ordinary care on the part of employees, which is not true of the aforementioned type of manual gear casualties.

On the record before it, it was the function and duty of the Commission to weigh the conflicting evidence, to reason therefrom, and particularly to differentiate between accidents happening under widely different circumstances. Its conclusion and order are abundantly supported by substantial evidence.

ARGUMENT.

I. THE COMMISSION'S ORDER WAS WITHIN THE SCOPE OF ITS AUTHORITY.

In view of the holding of the lower court (R. 223), that the Commission had jurisdiction and authority to proceed as it has done here, and the full argument upon the subject contained in the brief of the United States and Interstate Commerce Commission, we shall not burden the Court with extended argument upon this point. We rely on *Napier v. Atlantic Coast Line R. R.*, 272 U. S. 605, and the cases cited by Government counsel as authority for upholding the jurisdiction of the Commission and the procedure followed before it.

The carriers' contentions in respect of the Commission's jurisdiction, as disclosed from their answers to the complaint and the petition filed herein, are that: (1) A power reverse gear is not a safety device or appliance within the meaning of Section 2 of the Boiler Inspection Act as amended. (2) There is no authority conferred upon the Commission to entertain a complaint as was done in this case. (3) The only authority granted to the Commission in the matter of making rules is to approve, modify or disapprove such rules as may be submitted to it (*by the carriers*), under the provisions of the Boiler Inspection Act.

Comparison need only be made to the principles announced in the *Napier* case to show how hollow is *their* first contention. This Court there said (page 611):

> "The requirements here in question (the equipment of locomotives with cab curtains and automatic fire doors) are, in their nature within the scope of the authority delegated to the Commission. An automatic fire door and an effective cab curtain may promote safety. Keeping firemen and engineers in good health, like preventing excessive fatigue through limiting the hours of service clearly do so, although indirectly; and

> it may be found that to promote their comfort would likewise promote safety."

That problems of safety requiring solution were presented to the Commission by the filing of the complaint, is illustrated by the fact that the record shows 1116 casualties to have occurred to enginemen in the cabs of locomotives in handling the reversing gear while operating the locomotive or train (R. 54), of which number it was estimated about 980 had occurred on locomotives equipped with manual reverse gears, and the fact that since 1915 more accidents have been traceable to the reversing gear than any other type of accident investigated by the Bureau of Locomotive Inspection save two. (R. 1263, 1398.) The record moreover shows that the handling of manual reverse gears requires excessive physical effort on the part of enginemen which affects their comfort and general welfare and results in a lessened ability to perform the manifold duties required of them in the operation of locomotives and trains. (R. 345, 359.) In this situation the evidence shows, as will be developed later in this brief, that the substitution of power gears for manual gears directly promotes safety by practically eliminating the casualties above referred to, and further relieves the enginemen of the fatigue, undue strain and apprehension of injury attendant upon the use of manual gears.

For the authority of the Commission to entertain the complaint of the Chief Executives of the Brotherhoods, we need only cite the express statement of this Court in the *Napier* case, (page 613), that:

> "If the protection now afforded by the Commission's rules is deemed inadequate, application for relief must be made to it. The Commission's power is ample."

The court's language is particularly significant when the situation then before it is considered. The Brotherhoods

were seeking remedial action through the enactment of state statutes prescribing certain equipment upon locomotives. In holding that state legislation was precluded because the Federal statute had occupied the field, the court, obviously having in mind the object sought by the Brotherhoods, comprehensively construed both the purpose and effect of the Boiler Inspection Act, and was careful to say that the power to specify the sort of equipment to be used on locomotives, and to prescribe the rules and regulations by which fitness for service shall be determined, belonged to the Commission, and that the Commission's power to grant relief on application to it was ample.

It is illuminating to recall that when the *Napier* and *Wisconsin* cases (which were argued together), were before this Court, counsel for the carriers in the *Wisconsin* cases suggested the very procedure here followed, saying in their brief, page 37:

> "* * * It is not doubted that if unsatisfactory conditions as to cab curtains could be shown to the Interstate Commerce Commission, that Body would readily rectify those conditions by supplemental rules requiring satisfactory cab curtains."

The principal contention of the carriers is that the only authority of the Commission under the Boiler Inspection Act, as amended, in the matter of making rules at the present time, is to approve, modify or disapprove such amendments to existing rules as may be submitted to it by the carriers under the provisions of the Act. This means, of course, that the Commission's power to determine what rules are necessary to carry out the purpose of the Act, while ample at the time the original Code was being prepared, was lost after the first set of rules had been promulgated (in 1911 as to boilers and in 1915 as to other parts and appurtenances of the locomotive).

This construction of the Act is entirely contrary to its plain and expressed purpose. As seen by its title, the object of the Act is to promote the safety of employees and travelers by compelling common carriers to equip their locomotives with safe and suitable boilers and appurtenances thereto. By using the word "promote," which means to "cause to move forward to a desired end," it seems clear that Congress contemplated a continuing betterment of safety conditions. No one can conceive of a situation in which at the time of the promulgation of the first set of rules and regulations, complete and unchanging safety had been achieved.

Moreover, the entire Act is drawn upon the theory that compulsion upon the carriers is necessary to provide the degree of safety contemplated by the Act. If, as the carriers contend, the rules may be changed only upon their initiative, then the incongruous result is that the Act requires the carriers to compel themselves.

That Congress intended the Commission and not the carriers to be charged with final responsibility in the matter of prescribing rules requiring additional safety devices and equipment for the promotion of safety is obvious from the very fact that Congress found it necessary to enact the statute, for previously thereto the initiative had rested entirely in the hands of the carriers in so far as federal laws were concerned. To leave the initiative entirely with the carriers would have been *to leave the situation as Congress* found it, and the enactment of the statute would have been a vain and futile thing. As the District Court said in its opinion (R. 208), such a construction of the Act "would lead to a conclusion tending to a large degree of frustration of the office of this legislation to effect the purpose of the Act as reflected in its title."

The Act, being remedial in nature, should be construed so as to effectuate its obvious purpose. (*Cf. Balti-*

more & O. R. R. v. I. C. C., 221 U. S. 612; *Johnson v. So. Pac. Co.*, 196 U. S. 1.) It was enacted to promote the safety of employees. (*B. & O. R. R. v. Groeger*, 266 U. S. 521, 528.) Such being the case, to deprive the employees of the benefits of newly developed safety devices would certainly contravene the intention of Congress.

We are not left in doubt, however, as to what the intention of Congress was in passing the Act. This Court in the *Napier* case in determining the scope and *effect* of the Act, held (page 612):

> "The question whether the Boiler Inspection Act confers upon the Interstate Commerce Commission power to specify the sort of equipment to be used on locomotives was left open in *Vandalia R. R. Co. vs. Public Service Commission*, 242 U. S. 255. We think that power was conferred. The duty of the Commission is not merely to inspect. It is, also, to prescribe the rules and regulations by which fitness for service shall be determined. Unless these rules and regulations are complied with, the engine is not 'in proper condition' for operation. Thus the Commission sets the standard. By setting the standard it imposes requirements. The power to require specific devices was exercised before the amendment of 1915, and has been extensively exercised since."

The court further declared (page 613):

> "If the protection now afforded by the Commission's rules is deemed inadequate, application for relief must be made to it. The Commission's power is ample."

II. THE COURT ERRED IN HOLDING THAT IN ITS CONSIDERATION OF THE CASE AND THE MAKING OF ITS REPORT AND ORDER THE COMMISSION ACTED ARBITRARILY AND UNLAWFULLY

in that it failed and refused to give consideration or legal effect to important material facts established before it by evidence substantially uncontradicted; ignored and disregarded the indisputable character of such evidence; and reached conclusions contrary thereto and unsupported by any substantial evidence. In so holding, the court, without warrant, substituted its judgment for that of the Commission in respect of a matter the determination of which is vested in the Commission.

In its opinion (R. 209) the court recognized that it was bound by the rule that it "should not weigh evidence, nor consider the wisdom of the Commission's action if its determination finds substantial support in the fact record," *Chicago R. I. & P. Ry. v. U. S.*, 274 U. S. 29, 33; nor "inquire into the soundness of the reasoning by which its conclusions are reached, nor question the wisdom of the regulations prescribed by it." *Western Paper Makers Chem. Co. v. U. S.*, 271 U. S. 268, 271; *I. C. C. v. Ill. Cent. R. R.*, 215 U. S. 452, 471; *U. S. v. New River Co.*, 265 U. S. 533, 542. But it asserted that it might "regard the fact situation to determine, if it is claimed, whether the Commission has acted arbitrarily or inconsiderately in some particular." *B. & O. R. R. Co. v. U. S.*, 264 U. S. 258; *Interstate Commerce Commission v. L. & N. R. Co.*, 227 U. S. 88, 90, 91; *U. S. v. Abilene & So. R. Co.*, 265 U. S. 274; *A. T. & S. F. Ry. Co. v. U. S.*, 284 U. S. 248.

Unless it be established that the Commission's order was not supported by substantial evidence, or was arbitrary, the court has no concern with the fact situation. It

is our purpose to show that, as revealed in its findings of fact and the particulars specified in support thereof, the court misconceived and misconstrued the evidence; that no arbitrary action on the part of the Commission was shown; and that the court's decision constituted an unwarranted substitution of its judgment for that of the Commission.

The court's conclusion that the Commission acted arbitrarily is based upon Findings (4) and (5) of its Findings of Fact. (R. 219-223.) These findings, and the particulars specified therein, will be discussed *seriatim* as follows:

FINDING OF FACT NO. 4.

> "In its consideration of the case the Commission failed and refused to give consideration or legal effect to important material facts established before it by evidence substantially uncontradicted, and ignored and disregarded the indisputable character of such evidence; and reached conclusions contrary thereto and unsupported by any substantial evidence; all as more particularly shown below:
>
> FINDING 4, Subdivision (a):
>
> (a) The use of power reverse gears on locomotives has not eliminated all accidents caused either in connection with such use or by failure of the gear properly to function. Such accidents have included the same types as occur where manually operated gears were used, viz., strains, bruises, cuts, broken bones, etc., received in the engine cab in connection with handling the reverse mechanism, and injuries to enginemen and others outside the cab when oiling or otherwise attending to their engines. Accidents of the former type are more numerous on hand reverse locomotives, and of the latter type more numerous accidents have occurred, inflicting much more serious injuries, including several deaths, from operation of power reverse gears." (R. 219.)

While the statement "the use of power reverse gears on locomotives has not eliminated *all* accidents caused either in connection with such use, or by failure of the gear properly to function," is literally true, yet the record shows by the overwhelming preponderance of the evidence that the use of power reverse gears has substantially eliminated accidents properly attributable to the reversing gear, as will be subsequently shown.

The court here found that power reverse accidents "have included the same types as occur where manually operated gears were used, viz., strains, bruises, cuts, broken bones, etc., received in the engine cab in connection with handling the reverse mechanism." Although this statement is correct the significant fact is that of 263 witnesses called by the carriers only 10 testified to injuries occurring to them when operating the power reverse lever or wheel, these 10 injuries being scattered over a period of 18 years. Three of the ten suffered slight injury while handling the obsolete Mellin or McCarroll gear.[1] The injuries of two others were inconsequential.[2] The other five injuries occurred with Franklin precision gear and were due to lack of proper maintenance of the gear, or happened under circumstances which would have caused the same result with manual gear.[3]

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[1] *Fraley* (R. 455, 456); *Coyle* (R. 768); *Maloney* (R. 1246, 1249).

[2] *Burkhalter*, hand slipped off latch, off duty two days (R. 690,

[3] *Slosson*. Wheel came off striking his knee. The notches in the locking device had been broken off and he was trying to hold the wheel with a piece of wire, indicating the defective mechanical condition of the gear. (R. 757.)

Dickhaut. The gear had not been operating right, and he strained his shoulder, but stated the company had it corrected by changing the gear. (R. 886.)

Ryan. The wheel stuck and then went into back motion, breaking his wrist. He stated, however, that based on his experience he could not say that the hand lever is any safer than power reverse. (R. 749.) (Continued on page 21.)

Exhibit 13 (R. 1420-1486, 1499) further emphasizes the fact that injuries properly attributable to the reversing gear, and particularly those occurring to the operator thereof, have been practically eliminated on locomotives equipped with power reverse. Only 12 power reverse casualties were reported to the Bureau of Statistics by the carriers during the years 1929 and 1930 as compared with 219 such manual reverse casualties included in this Exhibit.[1]

All of the 219 injuries shown in Exhibit 13 to have occurred on manually reversed engines, (with the exception of two cases questioned by the carriers in which the engineer was thrown against the throttle and brake valve), were sustained by enginemen in the cab of the locomotive while operating the reverse gear. In addition thereto the record contains the testimony of witnesses to 50 illustrative cases of injury on 25 different roads sustained by enginemen in handling manual reverse gear. (See summary, pp. 88-90, this brief.)

This comparison of the accident evidence—of injuries directly and unquestionably attributable to the type of gear used—demonstrates not only the constant and continuing hazard to which men handling manual gears are subjected, but also the practical elimination of such injuries on power reversed engines.

Harris, was reversing a Mallet which had its low pressure or forward engine inclined over the apex of a hump, causing the wheel to kick back. The same or a worse injury would have resulted from manual reverse due to the size of the engine and the strain placed on the machinery by the position in which it was standing. (R. 1315.)

Emsworth. The wheel kicked back breaking his wrist due to the counter-balance spring jamming and causing an unusual strain on the tumbling shaft and the witness stated that he would have gotten a kick from the manual screw or manual bar under the same circumstances. (R. 1316.)

[1] The Commission used the ratio of 216 casualties on manually reversed locomotives as compared with 16 casualties on power reversed locomotives (R. 54) which appears to be slightly in error.

The court further found that power reverse accidents have included injuries to enginemen and others outside of the cab when oiling or otherwise attending to their engine.

This subject is also treated in findings designated 4e (R. 220), 4g (R. 220), 4h (R. 221), 4i (R. 221). In this series of findings the court refers to certain types of injuries sustained by men caught in the valve motion of the locomotive, (1) when the reverse gear was operated by someone in the cab, and (2) when the reverse gear moved without being operated by anyone in the cab.

With respect to the first class of accidents mentioned above, which include most of such valve motion injuries, the mechanical construction and arrangement of the parts involved is important. It will be recalled that the valve motion of a locomotive consists of the rods, arms, links, rockers, eccentrics, or eccentric cranks, etc., and other parts of the locomotive outside of the cab, which are connected to the driving wheels, steam valves and tumbling shaft. It will be understood that when a man is caught in the valve motion, he is caught by machinery which is the same on both a manual and a power reverse engine. When the reverse gear is moved the valve motion responds, whether such movement is actuated by manual or power reverse.

In weighing the evidence on this subject, and before attaching any significance to it, the conclusion must be reached from the evidence that such accidents are properly attributable *to the type of reversing gear,* and that with manually operated reverse gear the presence of an obstruction, such as the arm or head of a man, can be detected by the resistance offered to movement of the hand lever or wheel, whereas with the power reverse gear this would not be detected.

There was no credible evidence before the Commission that the operator of a hand reverse gear when reversing the engine, can feel the obstruction offered by a man's head or arm caught in the valve motion in time to avoid injury.

In its opinion (R. 212) the court said:

> "Two witnesses operating levers testify to the feeling, one being a case where the engineer's head was the obstruction, and much opinion from men experienced with both kinds of gears. It is also supported by reason—the presence of an obstruction is directly notified to the operator of a lever, whereas the operating wheel simply starts insensate machinery into operation."

Contrary to this finding, no witness testified that he had felt such obstruction. How erroneous the Court's conclusion was, and the extent to which it trenched upon the Commission's right to weigh and reason from the evidence, may be seen from the evidence upon this subject.

In the first case alluded to by the Court (McGuire R. 713), it will be observed that the witness himself did not feel the obstruction, which was a man's head, but based his testimony upon a remark of the fireman to the effect that the latter had felt the obstruction. The fireman was throwing the reverse lever into forward motion. The engineer, unknown to him, had placed his head between the upper lift arm of the tumbling shaft and the end of the right front driving spring, a space of a foot or something thereabouts. When the lever was about half way to the corner the engineer hollered and the fireman moved the reverse lever back again. The engineer's head was cut over the right temple just enough to make it bleed, and the skin on the left side of his head was not broken. After washing his face, the injured man went on with his run. The witness testified that there were no marks on the other side of the engineer's head due to the fact that the lifting arm shaft was smoothed off on that side whereas the side that caught him was rough, as the lift arm where the reach rod connects to it is smooth, and *he shoved his head against the end of the spring.* In other words, the fact was that the engineer merely bumped his head on the end of the

driving spring when he was getting out of the way of the moving machinery. The moving part of the machinery, the tumbling shaft arm, touched him only lightly, if at all, as is evident by the fact that the skin was not even broken on the left side of his head where the arm would have struck if it had caught him. The opinion of the witness that an obstruction so slight as just to cut the skin on one side of a man's head but not on the other side could be felt by the fireman back in the cab is so overdrawn as to be unworthy of credence. Since the fireman was not produced as a witness, there was no opportunity for cross examination of his statement, which was only hearsay.

In the second case (R. 1148) the operator of the manual lever in throwing it to the corner caught another man's toes underneath the reach rod between it and the running board, *and not in the motion work at all.* When the lever was on center there was from three to five inches clearance between the reach rod and running board at some places, though at the point where the reach rod was connected to the tumbling shaft there was very little clearance. It was not shown at what point between these two extremes the man's toes were caught. The thing of significance is that when the man hollered the operator got the assistance of two more men, who gave him a hand, and they set it down a notch or two more, showing, as is clearly established by the evidence, that *when an engineer meets with resistance he uses all the more strength in an effort to put the lever where he wants it, and does not stop to find out whether anyone is caught.*[1] There are many reasons why, under existing operating conditions, one reversing a manually

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[1] Typical statements are:

"In throwing over a hand reverse lever oftentimes more strength than I have is required. Sometimes I have to move the lever *in four or five hitches.* A foot brace is furnished located about the middle of the quadrant ahead of the seat and I use

equipped engine cannot be expected to detect a human obstruction in the valve gear. To begin with, the parts of the reverse gear and valve motion moved by operating the lever or wheel weigh approximately two thousand pounds or more. (R. 1296.) As stated in the Commission's report (R. 53), "friction between certain parts of the reverse gear and of the valve gear and between parts of the valves and the steam chests as well as the weight of the parts whether or not counterbalanced makes it necessary that considerable force be exerted in order to move the reverse gear. The force required is increased if there is steam in the steam chest and cylinders * * * and because of several other conditions which arise in practical operation." This statement is borne out by the practice of the operator in bracing himself upon foot braces furnished by the carriers for the purpose or upon pipes, or the boiler head, and by the fact that it is frequently necessary to call upon the fireman for assist-

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that in operating the lever. I am not able to handle the lever myself in all cases and have to get the fireman to help me." (R. 271.)

"You couldn't turn the wheel (manual screw) without jerking it. *You jerked it a notch or two at a time.* It worked so hard. I had my feet on the floor and used all of the strength I could pull with." (R. 278.)

"I had gotten half way over (in reversing the engine) and *I was stuck, so I got a better hold and tried to finish the job* and got a sharp pain up the side which resulted in a rupture. I had to get the helper to help me finish pulling the lever clear back." (R. 334.)

"I tried to get my reverse lever over after I had made the coupling, shoved back and made the coupling, and I got the reverse lever up about two notches in the quadrant *and she stuck and I lunged at it* and could not get it over and I got behind it and shoved it until it got to the center." (R. 397.)

"When I had it (the manual lever) in back motion, I could not shove it ahead until I braced myself. It was *just by degrees* that I could shove the lever ahead." (R. 388.)

ance.[1] The nineteen cases of hernia, torn ligaments, displaced bones and strained or wrenched backs shown in the record to have been sustained in attempting to reverse a manually equipped engine, are eloquent testimony of the strength required and the unexpected difficulties encountered in this operation. These observations become particularly significant when it is considered that the lever is frequently handled when the operator is in a hurry or under the stress of excitement.[2] Thus, the engineer having been trained by long experience to reverse his locomotive in the face of various difficulties, cannot be expected to distinguish

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[1] How strenuously the engineer must exert himself in reversing the engine is illustrated by the following testimony:

"To throw her over at any time you have to put your foot up against the boiler head and put all of your strength in your body to get it over." (R. 254.)

"In yard service operating the lever sometimes takes all the strength you have and sometimes the strength of two or three • • •. I have had the fireman and the brakeman come up and help. Hard handling is characteristic of the hand operated gear." (R. 263.)

"The link motion on the links or link blocks get frozen up and full of ice and snow. I have often had occasions when I could not move the lever in either direction, even with the assistance of the fireman. • • •" (R. 302.)

"Even when I have a manual lever, which is not what I would call a hard one to handle, I have to brace myself and exert lots of strength and give it a hard pull. I would say that it is ordinarily easy most of the time. I have to put my weight against the lever." (R. 360.)

"The lever was in forward motion and I went to reverse it into backward motion, but could not cut her back. I just braced myself and pulled the lever and I felt the strain and that was all of my work that night." (R. 373.)

[2] See the following illustrative cases in which the witnesses were severely injured.

"I pulled and jerked and did everything I could to get it in back motion, but couldn't budge the lever. I put a piece of gas pipe about two feet long on top of the lever to get a better purchase but still couldn't budge the lever. *I knew they were in a hurry to get out of there because a passenger train was approach-*

between a human obstruction (even if he could feel the same, which appears to be impossible), and other obstructions which he constantly meets and overcomes.

As against these underlying facts, the court refers to opinion evidence (contradicted by complainants' evidence, R. 1345), to the effect that the operator could detect a human obstruction in the valve motion. But it is significant that carriers' witnesses who testified that in their opinion they could feel such obstructions based their opinions upon the obstruction which they had experienced from boards, buggy bars, bolts, nuts, or other metallic obstructions (R. 1098, 1128, 1129); or snow, or ice on the links (R. 673), *none having experienced catching a human hand or head.*

Others of the carriers' witnesses, who had caught and injured men in the valve motion of a power reversed engine or had been caught themselves, testified that in their opinion the result would have been about the same with manual reverse (R. 634, 1137), or that before one did feel the obstruction the damage would be done. (R. 1162.)[1]

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ing, so I got behind the lever and tried to push it, and threw my whole weight of 196 pounds on it. I got behind it and braced myself but couldn't budge it. The fireman then appeared and gave me a hand, and we finally got it into back motion. We immediately left ahead of the passenger train." (R. 260.)

"The engine foreman gave me a proceed signal, and I opened the throttle wide but my engine would not move. He immediately gave me a back-up signal for the purpose of taking the slack. I closed my throttle and reached for the reverse lever and gave it a reasonable jerk, but I was unable to reverse it, so I braced myself again and tried it again, and I applied all of the strength I had. At this time my hand slipped over the top of the reverse lever, over the latch, and I fell backwards in a sort of a zig-zag position." (R. 370.)

[1] The testimony of Appellee's witness Stearns, who had caught a man's head in the valve motion of a power reverse engine and ventured the opinion that he would have felt the obstruction to the gear and stopped if he had been operating a manual lever, is typical of the carriers' evidence on this subject. It supports

Finally, the record fails to show that the carriers removed the power reverse gear or substituted a hand gear upon any of the locomotives upon which men had been caught in the valve motion. The witnesses who were asked

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the conclusion reached by the Commission at page 360 of its report, that in actual practice an engineer cannot be expected to feel such an obstruction in time to avoid injury. The witness testified—

"Ex. Rogers. The one thing I am particularly interested in in that connection is what previous experience have you had that leads you to believe that you could have felt an obstruction caused by this man's head being squeezed a couple of inches while you were operating a hand reverse lever?

The Witness. If there is an obstruction in the gear, it can generally be felt when it comes to that point of the obstruction.

Examiner Rogers. What do you usually do? Pull a little harder?

The Witness. It depends how hard it comes up there. If it stops, you look around and investigate what is wrong.

Examiner Rogers. *If it is so hard you cannot pull it, then you investigate it?*

The Witness. *Yes.*

Examiner Rogers. But suppose you got to a place where she just pulled a little hard, would you then quit right there and look around or would you give her a yank?

A. *I possibly might give her a yank.* More than likely a man would look around.

Examiner Rogers. It depends on how hard it pulled and it would depend upon what the obstruction was, wouldn't it?

The Witness. It would; yes, sir."

By Mr. Smith:

"Q. If you met with an obstruction under such circumstances where there were men working around the engine, what would you do?

A. I would stop and find out. It might be a hand or foot or something in the gear. A man would naturally go down there and look around.

Examiner Rogers. Do you have any idea that anybody was liable to get killed down there when you reversed?

The Witness. No, sir; I did not, but since that I have had it impressed on my mind.

Examiner Rogers. But at that time?

The Witness. No, sir.

Examiner Rogers. *You never thought of such a thing,* did you?

The Witness. *No, sir.*" (R. 1098-1100.)

the question testified that after such accidents the particular locomotives were still equipped with power reverse gear. (R. 551, 673, 1166, 1168, 1169, two cases.) Other witnesses testified that by changing operating rules similar accidents could be prevented. (Burnett, Supt. of Motive Power U. P. R. 1111, Stearns, R. 1101, 1102.)

Upon this state of the record, and in view of the highly conjectural claim made by the carriers on this subject, and the technical nature of the evidence, the question as to whether or not such injuries are attributable to the type of reverse gear employed, is peculiarly one for the Commission to decide, informed, as it is, by experience in such matters. In the face of this evidence which, when viewed most favorably to the carriers' contention, is conflicting, the finding of the court that such fatalities are chargeable to the operation of power reverse gears is erroneous, and an unwarranted substitution of its judgment for that of the Commission.

Turning now to the second class of accidents shown in the record as occurring to engineers and others outside the cab when oiling, or otherwise attending to their engines, isolated cases are shown in which the reversing gear moved without being operated by anyone in the cab. The evidence of such accidents related to occasions when the air was cut into the power reverse cylinder after having been shut off, or was leaking away from the gear, or to cases due to defective mechanical condition of the gear. It will be understood that when the air is being pumped up or turned into the gear after having been shut off, a readjustment in the position of the power reverse piston will occur, and if the valve motion has settled or dropped during the time the air is off the gear, such readjustment will cause it to move back to its normal position. An engineer, of course, knows this, and if while the air is being pumped up he places his arms or body in the valve motion before

this process of readjustment has been completed he is, of course, liable to be caught by the movement thereof. For example, a carrier witness came to his engine with the pump shut off, turned it on, and then started to oil around. He put his hand between the reverse yoke and valve frame, and the gear shifted from center, forward and then back, catching his hand. He nevertheless expressed the opinion that power reverse is safe as long as it is kept in good working condition, evidently not attributing his injury to any fault of the gear, which performed only as might be expected. (R. 719.)

Accidents of this sort are obviously of a different kind from those repeatedly occurring to the men in the cab who are handling the reverse gear on the line of road or during the normal movement of the locomotive when their manifold duties necessarily divert a considerable part of their attention from the particular act of handling the reverse lever. As the Commission found in its report (R. 56), the engineer or other person operating the locomotive, is as a matter of actual fact constantly subjected to whatever hazard exists in operating the reverse gear, and under many circumstances he has no way of effectively guarding against injury. The contrary is true with respect to men who place their arms or hands in the valve motion knowing that they can expect the valve gear to readjust itself at any moment, or those who otherwise are careless in working about a mechanical device which is out of order. Such accidents on power gear engines, when contrasted with the severe and frequent injuries directly sustained from handling manual gears under the circumstances just mentioned, are no warrant for the finding of the court on this subject, and do not evidence arbitrary action on the part of the Commission in not regarding them as outweighing the manual gear accidents.

FINDING 4, Subdivision (b):

> (b) Hand gears being simpler in constructions, respond more readily in cases of emergency; and in such situations when air pressure is not available to operate gears, may be quickly and effectively employed to control movement of the locomotive and avert accidents; whereas in the same situation power reverse gears depend upon air pressure, so that an engine equipped therewith cannot be so controlled except where there is time to cut in an emergency steam connection to operate the gear. (R. 219, 220.)

The attention of the Court is drawn to the fact that the situations covered by this finding relate only to occasions when air pressure is not available to operate the power reverse gear, in which case the claim of the carriers is that the hand gear may be used as a brake by reversing the engine. Air brake systems having long since been perfected, the occasions for using the reversing gear for braking purposes are exceedingly rare. Superintendent of Motive Power Hall, of the Chicago & Northwestern, testified that he did not know of such instances in late years. (R. 1227.)

More important yet is the fact that there is no need for using the reversing gear for this purpose on a train, for it is conceded that the loss of air on a train will automatically apply the brakes on the cars and stop the train. (R. 581.) The claim of the carriers then is that in case of light locomotives (*i.e.* without cars attached) standing around terminals or running light on the line of road, when the air is not pumped up or the supply pipe breaks, it may be desirable to attempt to reverse the locomotive in an effort to stop it should it unexpectedly get away.

As to the rare instances in which a locomotive running light gets away from the operator without his knowing of the loss of the air supply which he has available on a light

engine for braking purposes, the record shows that the use of hand gears for braking purposes is ineffective, and what is more, is actually dangerous. As Mr. Hall testified (R. 1227) this operation is not good practice at high speed, for it places an extra strain on the valve motion parts and might strip the engine (*i.e.* tear the driving rods and connected machinery from the frame of the engine and the wheels). The record further discloses that under many circumstances this method of braking an engine is unsuccessful.[1] Again, in numerous cases engineers have been thrown and injured while attempting to use the manual lever as a brake.[2]

As stated in the court's finding, with the power gear the emergency steam connection may be cut in and the gear operated by steam in the event of loss of air. As to the time required to cut in the emergency steam connection, all that is necessary is to turn one or two valves conveniently located in the cab in order to at once admit steam into the air cylinder. Plainly it requires only a few seconds for steam under 200 pounds of boiler pressure to reach the

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[1] *Moore* case. Manually reversed engine went through roundhouse wall when there was no air to apply the brakes, and engineer was unable to get the manual lever over. (R. 1361.)

McHugh case. Undertook to use manual lever as brake but when he reversed the engine and gave it steam, lever flew back to its original position and he went into the baggage car. (R. 1325.)

[2] See the following illustrative cases taken from Exhibit 13: *Troxel* (R. 1437); *Keller* (R. 1440); *Leonard* (R. 1463); *Girts* (R. 1473).

In the *Leonard* case the carriers' report stated "in reducing speed of engine injured person was using reverse lever 'to cushion' the engine, and lever flew out of grasp and cut left foot between the lever and boiler head. He was bracing himself with left foot against boiler head. No unusual motion of engine. No defect. He suffered a contusion and laceration of left foot and leg causing 35 days probable disability."

gear when the connection is open. The gear can be successfully operated by steam. (R. 581.)

As to the instances in which locomotives standing in or about roundhouses without air have unexpectedly moved, reference is here made to our discussion of the next following finding of the court which particularly includes such cases. Suffice it to say that such unexpected movement of power reversed locomotives about roundhouses disclose a practical non-existent hazard. No casualties on power reversed locomotives were shown since 1916 as being attributable to this source. On the other hand there were numerous injuries shown in the two year period covered by Exhibit 13 to men who were attempting to reverse a moving locomotive with manual gear. Thus the very operation which the court mistakenly finds was of advantage in the case of manual gears has been productive of unnecessary peril to enginemen in attempting to so use the manual lever.

FINDING 4, Subdivision (c):

> (c) The report at p. 360 states it to be a matter of common knowledge that hand reverse locomotives sometimes move unexpectedly into roundhouse walls and turntable pits. The evidence shows that this cannot be caused by lack of air pressure and that the same unexpected movement of power reverse engines has occurred; and further, that if with insufficient air pressure available a hand reverse engine does unexpectedly start to move the same can be controlled by using the hand reverse gear for braking purposes, which could not be done with a power reversed engine. (R. 220.)

As is stated in the report, it is a matter of common knowledge (and shown in the record R. 1228) that hand reverse locomotives sometimes move unexpectedly into roundhouse walls and turntable pits. As to the unexpected movement of power reversed engines referred to by the

court, as previously mentioned, no injuries are shown in the record attributable to this source since the year 1916 when two isolated cases of power reversed engines thus getting away were shown resulting in fatal accidents.

In the first of these cases, (*Shockley* R. 641), a hostler attempted to move his locomotive before the air had been sufficiently pumped up, and attempted to throw the reverse gear into back motion, but there was insufficient air to cause the gear to function and the engine went ahead into the roundhouse wall, killing a man who was working at a desk. Since this accident the power reverse gear has been equipped with a lever which indicates whether the air reverse has responded, so that the hostler may know whether his gear is in working condition. He also testified that he throws his reverse back and forth two or three times before he moves it. (R. 643.) In 1916 power reverse was relatively a new device, and proper operating rules had apparently not been promulgated with respect to its use. At the present time such rules are in force. As testified by Superintendent of Motive Power Hall his company requires his hostlers, and anyone else going on an engine, to know whether the gear is in good operating order and to test the air before he gives the engine steam. (R. 1228.)

In the other case, *Wallace* (R. 715), a locomotive which had been overhauled was run outside the shop and fired up. The air pumps were not started, nor were the wheels of the engine blocked, which would be a usual precaution against a possible movement of an engine with no air brakes. The engine moved due to the fact that the throttle could not be entirely closed and steam escaped into the cylinders. (R. 1494.) The engineer, of course, could not operate the reversing gear by air, and it apparently had no steam connection. It ran into the shop and as three of the shop men were attempting to open the doors to permit the engine to pass on through they were caught, one being

fatally and the other two severely injured. This locomotive weighed 292,000 pounds on drivers, and Wallace, after expressing the opinion that he could have stopped the engine if it had been equipped with a hand reverse, admitted that he had never operated so large a locomotive equipped with manual reverse. In view of the experience of another engineman in the *Wyatt* case described below, it is doubtful whether he could have reversed this huge locomotive with the throttle partially open.

If the problem of the valve gear settling when the air is drained from a standing engine is a current one, it is plain that the various parts of the valve motion may be held in position by such a simple device as a set screw at the valve stem crosshead, which will secure the motion work as is done in valve setting operations. (R. 1145-1146.)

As to the statement in this finding that if with insufficient air pressure available a hand reverse engine does unexpectedly start to move the same can be controlled by using the hand reverse gear for braking purposes, which could not be done with a power reversed engine, the record shows, in addition to the evidence to the contrary set forth in our discussion of Finding 4 (b) *ante,* a case on a manually equipped locomotive similar to the *Wallace* accident above described. Hostler *Wyatt* testified that when bringing a locomotive off the turntable the throttle stuck open, that he attempted several times to reverse the manual lever, but could not do anything with it because of the pressure of steam in the cylinders and the fact that the lever worked hard without any steam. His brakes then let go because they were not strong enough, and his engine ran away, colliding with another locomotive and scalding to death the engineer on the latter, severely injuring the conductor and fireman and causing $16,000.00 property damage. (R. 1359, 1575.) Had Wyatt's locomotive been equipped with a steam connection, it seems clear that he

would have had a better opportunity to reverse the engine than his inadequate physical strength gave him.

Thus, the evidence upon the subject of the efficacy of controlling locomotives which occasionally moved unexpectedly into roundhouse walls and turntable pits even when taken most favorably to the carrier's contentions, is conflicting and there was again presented a situation particularly appropriate for submission to the expert judgment of the Commission. Moreover, the fact that no casualties have been shown which are attributable to this source since the year 1916, except injuries to engineers in attempting to thus use manual reverse gear as a brake, indicates that the hazards suggested by the carriers have been eliminated by proper operating rules, and accordingly, the court's finding on this subject is in error.

FINDING 4, Subdivision (d):

> (d) In several serious accident cases steam connections auxiliary to power reverse gears have proven ineffectual after air pressure has been lost; and in many emergencies there has been want of sufficient time to make use of the power reverse gear for braking purposes. Instances have occurred where pipe connections of power reverse gears were broken and the engine had become uncontrollable either by brakes or the reversing gear. Power reverse gears at times become inoperative through accidents to the auxiliary steam connections, such as freezing or destruction of packing within gear cylinders, in consequence of which some railroads have discontinued their use. (R. 220.)

As heretofore noticed cases in which the air supply is lost with the locomotive running on the line of road are exceedingly rare, and such cases do not happen to a train where the air brake system is connected to the car because the loss of air on the engine automatically applies the brakes on the engine train and brings it to a stop. Since

1917 only three cases resulting in casualties have been shown in connection with such runaway light engines [Cooksey (R. 815), Dalzell (R. 1089), Molte (R. 1318)]. A fourth case did not result in injury to anyone [Bailey (R. 1105)].

Under the peculiar circumstances of these cases *and due to the fact that the auxiliary steam connection to the power reverse was unavailable or inoperative,* the engineer was unable to reverse his engine when the power reverse lost its air supply. While defendants suggest that with manual reverse these engines could have been reversed and stopped, in at least three cases it is entirely conjectural whether they could have been reversed at the speed they were running when the loss of air was discovered; Cooksey 33 or 35 miles per hour (R. 815, 816); Bailey 12 to 15 miles per hour with main rod broken on Young valve gear locomotive (R. 1103-1104); Molte 30 miles per hour. (R. 1318-1319.)

The striking fact about these cases is, however, that if the steam connection to the power reverse on these locomotives had been properly located and maintained these locomotives (except the Young gear engine) could have been reversed. In each case there was a most reprehensible failure on the part of the company to have the steam connection accessible to the engineer and in good operating condition.

Cooksey attempted to find the steam connection, but it was outside of the cab and had no extension handle, and with the steam blowing in his face, and the locomotive running 33 to 35 miles per hour, he was unable to get at it (R. 817), and had to leave the engine. The company moved the steam valve connection to the power reverse from the outside to the inside of the cab after this accident. (R. 818.)

Dalzell (R. 1088) had been able to slow down to 3 or 4 miles per hour by applying his brakes and reversing the engine before the air was lost, but when the air leaked away from the power reverse the engine reversed itself and moved forward. He sent the fireman out of the cab in front of the boiler to open up the steam connection to the power reverse which was located at the fountain. The fireman called for a wrench, and the witness said he saw him open the valve. The steam however did not reach the power reverse cylinder. The report of the Bureau of Locomotive Inspection (R. 1539-1540) disclosed that at that time (in 1917) the carrier had a practice of using blind gaskets in the steam connection which would prevent steam from flowing into the gear, and the conclusion of the federal inspector was that either there was such a blind gasket in Dalzell's case or else the fireman had been unable to open the valve with his wrench.

Dalzell testified (R. 1094) that the valves to the steam connection are now in a handy place, some being attached to the side of the boiler in front of the engineer's feet; that they are taking better care of them than they used to; that he has tried them out and they are kept in a workable condition; that he can cut them in in a half a minute or less; and that if the present circumstances had existed on the day of his accident his engine would never have run away.

Bailey (R. 1104) tried to cut in the steam when the main rod broke on the left side, destroying his air. The steam valve was hard to open, and he turned so hard on the extension rod that he twisted off the cotter key in at the valve stem, rendering the valve inoperative. Both he and the fireman left the engine, and fortunately were not injured. Notwithstanding his experience, this witness testified that he does not think either manual or power reverse

creates an unsafe condition in service, and if he had his choice he would put power reverse on his locomotive for the convenience and comfort it affords the engineer. (R. 1105.)

It is illuminating to note that while this witness expressed the opinion that he could have stopped this engine if it had been equipped with manual reverse, complainants produced an expert witness in rebuttal who showed that the mechanical construction of the Young valve gear, with which this locomotive was equipped, was such that it could not have been stopped by reversing the engine with the main rod broken, as it was in this case. (R. 1396, 1398.)

Molte was 2500 feet from a switch when he discovered he had no air. (R. 1319.) One of the valves to the steam connection of his power reverse was up at the fountain, and the other was outside the cab under the running board in such a position that he would have to have gotten out and laid down on the running board on his hands and knees to have operated it. There is no standard place for these valves on his locomotive. (R. 1320.) He figured he did not have time to open these two valves, and both he and the fireman left the engine. Although he expressed the opinion that in this particular case if he had had manual reverse he could have prevented the accident, he testified that taking in general the safety of operation he considers there is no difference between the two types of gear. (R. 1320, 1321.) As bearing on his opinion that he could have reversed this engine, he admitted that he had never reversed a locomotive of that weight running 25 miles per hour with manual gear. (R. 1322.)

No more striking evidence than these accidents could be obtained to show the necessity of the proper location and maintenance of the steam connection to the power reverse gear, and it is evident that it will require a rule of the Commission to accomplish this, since as late as 1931 at

least one large carrier (Southern Pacific) has not complied with this plain safety requirement, and another (B. & O.) has taken off the steam connection entirely.

The auxiliary steam connection is an integral part of the power reversing gear and is no different in mechanical principle than the air supply. It was specified by the United States Railroad Administration during the period of Federal control, and all locomotives built under its specifications were so equipped. (R. 423.) The finding of the Commission in support of its order requiring steam connections, "the matter of power reverse gears becoming inoperative while on the road due to loss of air pressure, can be taken care of by properly applied and maintained steam connections," (R. 59) is amply supported by the testimony of witnesses who had testified to these runaway cases, when they said that the steam connection valves were now properly located and maintained. Cooksey (R. 818, 819), Dalzell (R. 1094, 1095.) Under such circumstances it clearly will require only a few seconds of time to make the steam supply available for reversing the gear.

As to power gears becoming inoperative through freezing or destruction of the packing in the gear cylinders, it will suffice to point out that no casualties have occurred from this source, and since the use of the auxiliary steam connection is merely an emergency matter no importance can be attached to the fact that the packing is occasionally destroyed after they are put into use.

FINDING 4, Subdivision (e):

> (e) Serious injuries to employees have been caused by operation of gears of both types striking or catching a man of whose position of danger the operator was unaware. The engineer using hand reverse gear can more readily detect danger and prevent accidents of this character than one using power gear. The evidence discloses only minor injuries of

this character on hand gear locomotives, but five deaths on those equipped with power gear. (R. 220.)

Enough has been said in our discussion of Finding 4 (a) above to show that the court erred in finding that the engineer using hand reverse gear can more readily detect danger and prevent men from being caught in the valve motion than one using power gear; that, accordingly, no significance can be attached to the fact that five fatalities resulted from thus catching men on power reversed engines, these accidents not being properly attributable to the type of gear, and that the court's finding upon this subject is an unwarranted substitution of its judgment for that of the Commission upon questions of conflicting evidence.

FINDING 4, Subdivision (f):

> (f) As an engineer does not ordinarily reverse his locomotive while in motion, no danger is involved when he brings his head inside the cab to reverse at a standstill; the use of hand reverse gear does not substantially interfere with observation of signals or keeping a lookout. (R. 220.)

It is usually necessary for the engineer to leave his position at the window and come inside the cab in order to reverse a manual gear engine. When engaged in switching this of course requires him to take his attention from the signalmen or the switchmen on the ground.

At times a signal is changed while the engineer is inside the cab reversing the engine, and a missed signal may cause injury to some person. (R. 242, 253, 264, 265, 267, 268, 269, 274, 314, 330, 338, 367, 376, 411.)[1]

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[1] Illustrative of the importance of the engineer keeping a lookout at all times while switching is the following testimony:

"With manual reverse you cannot keep a lookout and your eyes on the men on the ground. You have to get your head in the cab to reverse the engine. As to whether that has any prac-

Moreover, in hooking up or dropping down the gear on a manually equipped engine the attention of the engineer is taken from his lookout during the time necessary to adjust the lever, and while the engine is running over the road. The length of time necessary to make this adjustment varies from perhaps half a minute to a minute or more. A train will run a considerable distance while this operation is being performed during which time the engineer has his attention taken from his lookout, and he may go by a short flag or signal. (R. 254, 259, 262, 268, 338, 353, 367, 386.)[1]

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tical effect upon my ability to perform my duties I will say that it does not exactly, but still they may be giving you a signal. If they are giving you a backup signal and you throw your lever over, and about that time they see something and give a stop signal, it may cause damage or injury to some person. I came near getting a switchman that way one time. We had coupled on to our train and had some cars to cut out, and as I coupled on to the train the switchman gave a signal to go ahead. I had to reach in and throw my lever over, and while I was doing that he gave me a stop signal which I did not see, and he went in between the cars." Fortunately, the fireman jumped out when the cars were moved and no damage was done. (R. 330.)

[1] Witness Greenwood testified:

"As to my ability to keep a lookout at the time I am hooking up or dropping down the lever, there are times when it would take perhaps a minute or more, or a half a minute or more, when I have to take my eyes away from the front window in order to brace myself and reach for the reverse lever. We have a brace on the floor where we brace ourselves, and while we are looking for this brace, especially in the night time, we have to take our eyes off the front window. There is danger in that because if you are going 45 or 50 miles an hour you can almost go two or three train lengths in twenty or twenty-five seconds, and you can go by a short flag or signal." (R. 259.)

"Our road is so crooked that when we come around a curve at 45 or 50 miles an hour we will not have three seconds to acknowledge the train control signal. On straight track we can see them for a quarter of a mile. We get no indication until we see the yellow light. It is very hazardous when running in a fog, when we cannot see two feet ahead of us. You have to keep your eye on the window every minute for fear you will get by one of the yellow lights." (R. 262.)

A further hazard is disclosed in the cases where the engineer meets with injury in handling the lever for when such accidents occur his attention and that of the fireman is taken from their lookout duties, during which time the engine is running practically wild.[1]

As to the claim of the carriers that while the engineer is inside the cab handling the manual gear he can nevertheless look out through the front window, witnesses testified that they can see only a short distance ahead and if a man is down alongside the cars it is impossible to see him without having your head outside the window. (R. 242, 378.)

As to the contention that a man need not handle the manual lever except at times when his lookout duties conveniently permit him to do so, reference need only be made to common operating conditions confronting the engineer. On one hand he is required to keep a constant lookout, which is his primary duty. On the other hand it is necessary for him frequently to hook up the engine, particularly when leaving a station (R. 387), at which time maintaining a continuous lookout is necessary because of men working around tracks and of grade crossings. Thus the handling of the lever is done at the risk of neglecting the lookout.

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[1] Engineer Snoddy was running into Milroy at forty miles an hour and leaning out of the cab to gauge his stop. The manual lever jumped out of the quadrant, striking him on the leg and dragging him down between the boiler head and lever. He had difficulty finding the brake valve and the train went forty car lengths while he was trying to get it stopped. He stated that while he didn't remember whether he was able to keep a lookout when caught in that position, he didn't think he was. (R. 298.)

Witness Pool testified to an occasion when his locomotive had just gone around a curve when his engineer in attempting to hook up the lever was thrown to the floor and the breath knocked out of him. Pool, who was firing, left his station and after slowing down the train, held the engineer on the seat box until he came to as the train was about to the yard limit and station. (R. 401.)

While no casualties were shown in the record due to such interference with the enginemen's lookout, the fact remains that a peril exists from this source as is indicated by the cases herein cited.

On the other hand, the evidence clearly shows that the engineer can operate the power reverse gear (which can be handled with one hand) and at the same time maintain a lookout, both in the yard and while running on the line of road. (R. 244, 255, 256, 269, 297, 313, 348, 367, 376, 411, 1321.)

FINDING 4, Subdivision (g):

> The "creeping" or unintended movement of the reverse mechanism and valve gear which the Commission found causes no accidents, does cause many and serious accidents and injuries as well as destruction of property. The evidence shows that at least one death was so brought about and probably another, together with several severe injuries. This tendency to creep is peculiar to power reverse gears, and reasonable maintenance of the apparatus is not sufficient, as the Commission holds it is, to overcome it. The view of the Commission that proper maintenance will prevent "creeping" in the case of power reversed engines is equally applicable to manual reverse gears, especially to those instances where the lever latch jumps out of the quadrant notch due to wear of the parts. (R. 220.)

The court has misconceived what the Commission had in mind in making its finding (Report R. 58) that "the [illegible] * * *" The term "creeping," as used by the witnesses in record, and the Commission in its finding, relates to the occasions *when the locomotive is running over the road* where the piston of the power reverse air cylinder (and consequently the valve gear), creeps slowly forward or backward without the operating lever in the cab having been adjusted, this con-

dition usually being due to packing leaks in the air cylinder or some unusual pull from the steam valves. During the time when the gear is thus creeping, the operating lever or wheel remains stationary in the quadrant.[1]

Somewhat akin to the evidence upon the subject of "creeping" is the testimony of some carrier witnesses that the power gear jumped and on occasions reversed itself. It was shown, however, that such action of the gear was caused by the engineer working the gear in too short a cut-off, i.e. with the lever practically on center, and that this difficulty can easily be overcome by simply dropping the lever down a few notches. (R. 1389, 1390, 1577.) The fact remains, as found by the Commission, that no injuries were shown from creeping, or the gear jumping, fluttering or reversing itself while the engine was running over the road.

That the court and the Commission were talking about different things is shown by the court's reference to one death alleged to have been brought about by creeping. This is the case described by witness Lambright (R. 1316, 1567), in which Engineer Ross had gone beneath the tender to make repairs to a brake beam and the locomotive moved,

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[1] Typical of the evidence on this subject is the following testimony:

"When the gear is creeping you notice a louder exhaust. That is an indication that the engine is getting more steam, indicating that the adjustment of the power reverse gear has permitted the valve to travel further and admit more steam. Then you hear a lighter exhaust and you know the gear has shortened the travel of the valve. This does not happen with any regularity or precision, and you cannot tell which way they are going to go, but usually they ultimately swing back the other way. Sometimes you have to adjust the lever to maintain your speed, and to overcome the creeping. With the Alco I have observed a fluttering of the cross head and pistons, in which it vibrates back and forth a very short distance. Nothing happens in the cab, but I can look out of the window and see it. I have not noticed any vibration of the hand lever in the cab when the cross head is fluttering." (R. 341.)

taking off his arm and striking him on the head. (While the head injury resulted in an impairment of his left side, and it was stated that the witness later died, it was not shown that his death was due to this accident.) It appeared that when the engineer left the locomotive the reverse lever had been placed on center, and after the accident it was found in the forward corner, but it also was shown that the brake had not been set, nor the wheels blocked, which of course, are precautions usually taken to prevent the engine from moving when an employee is working underneath the wheels. As stated in the report of the Bureau of Locomotive Inspection (R. 1569),

> "While the primary cause of this accident was due to the failure of the brake beam hanger, the excessive openings in lubricator chokes, (5/64 inch used instead of the standard 1/16 inch), allowed the steam pressure to build up against the valves. When the reverse gear went into forward motion, the steam was submitted (admitted) into cylinders, which caused the locomotive to move."

Lambright testified that the reverse lever latch and quadrant teeth were quite worn and that if the latch had been in proper condition he did not see how the locomotive could have moved, and that he never had one move on any other engine. (R. 1317, 1318.) Owing to the combination of the several mechanical defects and the extraordinary carelessness of the engineer in failing to set the brake when going underneath the tender, this accident cannot fairly be attributed to the use of power reverse gear on this locomotive, and the accident does not weigh heavily, if at all, in determining the safety of this type of gear.

From this instance, it will be seen that *when the court spoke of accidents due to the creeping of the power gear, it was referring to a few casualties shown of record, where the accidents were primarily due to other extraneous haz-*

ards of locomotive operation with which the power gear had only a remote connection.[1]

It is clear that these isolated accidents are different in kind from the numerous injuries received by enginemen directly due to handling the manual lever with the engine and train running over the line of road or in a yard crowded with traffic. The weighing of such considerations is peculiarly within the province of the Commission as the expert administrative body informed upon the subject of these operating conditions.

As to the finding of the Commission (R. 58), that if power gears are properly maintained, creeping to any material extent will be eliminated, it will be conceded that this type of gear does not always perform perfectly. The record is conflicting upon the subject of the amount or extent of creeping. Many witnesses testified that if the gears are properly maintained it will not creep, and that they experience very little, if any, trouble with creeping. (R. 244, 256, 291, 323, 330, 331, 360, 366, 367, 371, 413, 474, 511, 512, 621, 669, 887, 1206, 1331, 1332, 1334, 1337, 1339, 1340, 1341, 1343, 1348, 1350, 1356, 1364, 1367, 1373, 1374, 1389, 1391, 1393.)

The relatively little trouble that is encountered from creeping is shown by the fact that the highest class trains, both in passenger and freight service, are equipped with power reverse and maintain their schedules without difficulty. (R. 545, 739, 1226, 1339, 1342.)

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[1] In the *Blowers* case, the witness found the gear creeping and got down to repair it. (R. 637.) While standing on the main rod he called to the fireman to throw the reverse lever ahead, and when the fireman did this, the engine moved and caught his foot between the eccentric crank and the main rod, cutting off four toes. (R. 637.) He had failed to set the brake on the engine and the spring in the draw bars of his train and engine, together with steam in the cylinders, caused the engine to move a short distance when the gear was thrown in forward motion. The locomotive did only what could be expected under such circumstances.

Contrary to the finding of the court, proper maintenance of manual gears does not eliminate the dangers of handling this type of gear. With reference to the instances mentioned by the court in which the lever jumps out of the quadrant due to worn parts, the evidence discloses that such defects are only one of many causes for this dangerous action on the part of the manual bar. Even when the latching mechanism is properly maintained breakage in the various parts of the valve motion or valves,[1] or dry valves [2] (a condition which the record shows cannot be satisfactorily overcome) (R. 245, 278-280, 355), or uneven track (R. 259, 281, 284, 286, 288), or high speed (R. 298, 313, 314, 315, 337, 288), will unexpectedly pull the lever out of the quadrant, and sometimes the lever jumps out of its notch without any apparent cause. (R. 250, 272, 315, 303, 310, 402, 403.)

Nor does the proper maintenance of the reversing gear remove the hazard or insure the engineer against injury in handling manual reversing gear (as distinguished from its jumping out of the quadrant). Such operating conditions as dry valves, or steam in cylinders remain a source of peril even when the gear is in good condition. Moreover

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[1] In the serious accidents occurring to Engineers Small, Lowe and Pool, where the lever jumped out of the quadrant and struck the engineer with great force, the reports of the Bureau of Locomotive Inspection disclose that the reversing gear and latching mechanism were in good condition. (R. 1411, 1414, 1418.)

[2] In the case of Engineer Tanner, who suffered a severe fracture of his leg when struck by the manual lever as it jumped out of the quadrant, the witness testified that he observed nothing defective about the condition of the quadrant and latch, except as the engine began to kick on the lever, and that if he had a spring stiff enough to hold the lever in the quadrant, it would be very difficult to unlatch. (R. 289.) The report of the Bureau of Locomotive Inspection stated that the valve motion and reversing gear were found to be in good condition and that the work reports had been examined and nothing pertinent found. (R. 1407.)

injuries of this sort occur without any noticeable defects in either the locomotive or reversing gear.[1]

Finally the Form T. reports (Ex. 13) strikingly corroborate the fact that even when the reversing gear is in good condition innumerable accidents occur. Of the two hundred nineteen casualties occurring in two years from the handling of manual reverse, the record shows that in 119 cases the carrier reported that upon examination of the gear after the accident, it was found in good condition and no defects were noted.

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[1] Engineer Crum while shoving his reverse lever in full forward motion was struck by it in the breast and thrown to the deck of the engine when the lever flew back against him before he could release it. (R. 366.) The report of the Bureau of Locomotive Inspection stated that "apparently the primary cause of this accident was insufficient lubrication to valves, which was the cause of left valve chamber bushing being scored, which in turn caused exhaust ring to break and when Engineer Crum attempted to push reverse lever in stream forward motion, the broken part of ring caught in port and locomotive moved forward on valve forcing the unlatched reverse lever back violently, striking Engineer Crum on left side of chest. Accidents of this nature would not occur if locomotive were equipped with power reverse gear." (R. 1417.) The locomotive was equipped with a force feed lubricator, which the testimony shows the engineer is unable to regulate after the locomotive leaves the terminal, there being no regulating device in the cab. (R. 279, 355.)

Engineer Dixon in reversing the engine while taking slack found that the lever stuck due to steam in the cylinders. He could not open his cylinder cocks to drain off the steam because his engine was in the passenger yard where people are likely to be near his engine. He got behind the lever and shoved it until it got to center and when he got the exhaust steam it went down quickly, and he sustained a hernia, requiring him to undergo an operation. (R. 397, 398, 399.)

Engineer Adams while attempting to hook up the manual lever had it jerked out of his hands and it caught his foot between the lever and boiler head, as the result of which he was off duty seven months. He testified that so far as he could see the manual gear was in good order at the time of the accident; that the locomotive was well lubricated, and that he did not know what was the cause of the lever going forward. (R. 354, 355.)

Thus, not only was the court in error in its expression of the degree to which proper maintenance of manual gears will prevent accidents, but the evidence here referred to amply supports the finding of the Commission (R. 56) that "The engineer or other person operating the locomotive is as a matter of actual fact constantly subjected to whatever hazard exists in operating the hand reverse gear, and under many circumstances he has no way of effectively guarding against injury."

FINDING 4, Subdivision (h):

> (h) The great majority of injuries sustained on engines equipped with hand reverse gears were of minor character and resulted in temporary disability only, the large majority being trivial and causing only a few days' lost time. On the other hand, nine deaths are shown to have resulted from operation of locomotives equipped with power reverse gears, and a considerable number of permanent and serious personal injuries also so resulted.

As to the triviality or minor character of the casualties resulting from handling manual reverse, the court's attention is drawn to the fact that of the 50 injuries testified to by complainants' accident witnesses, there were 13 cases of fractured bones, 12 hernias, 13 cases of torn or sprained ligaments, 9 cases of bruises or cuts and 3 cases of scalding. As to the severity of the manual reverse accidents contained in Exhibit 13, suffice it to say that there were 23 cases of broken bones, 7 hernias, 108 torn or sprained ligaments, 68 bruises and cuts, 4 dislocations and 9 cases of internal injuries. Enough has been said elsewhere in this brief to show the severity of the manual reverse injuries.

See pp. 88-90 this brief for testimony descriptive of such injuries.

In the second statement of this finding the court expresses exactly what appellants contend, namely that "9 deaths are shown to have *resulted from the operation of locomotives* equipped with power reverse gears, and a considerable number of permanent and serious personal injuries also so resulted." That is to say, these fatalities, while resulting from the operation of locomotives, are not attributable to the use of power gear, but arose from other extraneous hazards of locomotive operation.

FINDING 4, Subdivision (i):

> Oral evidence before the Commission showed approximately the same number of accidents causing personal injuries resulting from the use of each of the two types of gears. Documentary evidence consisting of form T accident reports for 1929 and 1930 showed 216 accidents from hand reverse gears and 16 from power reverse gears, but many accidents of the latter type were not included in these reports.
>
> Injuries shown by oral testimony from hand reverse accidents caused permanent disability in two cases, the remaining being much less serious, though there were several hernias and cases of broken bones. At least 18 of these were the result of indiscretions or neglect on the part of the operator, or failure in maintenance and inspection of the gears. On the other hand, nine deaths resulted from accidents due to power reverse gears, and several permanent injuries, fractured skull with seventeen months' lay-off and an award of $10,000, amputated arm, and eight other cases of injuries very severe in comparison with those occurring on hand-controlled apparatus. The 216 injuries shown on form T reports, in connection with hand gears, were minor and in no case involved permanent disability. In only three of them was the injured person off duty more than 60 days, and over two-thirds resulted in from 4 to 15 days' lost time.

> In considering the comparative number of accidents shown by the record in connection with the two types of gears the Commission gave no effective consideration to the comparatively more serious character of injuries, deaths, and property damage resulting from the use of power-equipped locomotives. On the contrary, it based its fact finding by counting or tallying the injuries attributable to hand-operated gears, on the one hand, and to power gears, on the other; in effect giving the same consideration to a slight or temporary injury as to a serious or permanent one, when comparing the merits as to the safety of the devices. See *Automatic Fire Door Case,* 151 I. C. C. 448, 464, where the Commission approves the statement: It does "not matter how many minor injuries you have, you could not have enough of them to counterbalance one death." (R. 221.)

In its statement that the oral evidence showed approximately the same number of casualties resulting from the use of each of the two types of gears, the court overlooked an important factor. In their case in chief the complainants by forty-three witnesses from twenty-four representative roads, introduced evidence of forty-seven illustrative cases of personal injury directly due to manual reverse gear, nearly all of which occurred in the last five years. No attempt was made to cumulate the evidence. The carriers, however, appear to have practically exhausted the showing of injuries occurring on power reverse engines, having called two hundred sixty-three witnesses. They produced some forty-seven accident cases, many occurring as far back as 1916 or 1917, which they attributed to the use of power gear. Of the nine deaths which they sought to attribute to power gears, six occurred in the period between 1916 and 1923. This situation should have been reflected in the court's finding.

The court indicates that many power reverse accidents are not included in the form T reports comprising Exhibit

13. It will be noted that one of the requirements of the form T reports is that the carrier state briefly the cause of the accident. (R. 1420.) The absence of certain casualties on power reversed engines from the classification "Reverse Gears, Operating," referred to by the court, is evidently due to the fact that the carriers themselves, in reporting the cause of the accident, did not specify that the operation of the power reverse gear had any connection with the accident.

As to the severity of hand reverse accidents, the disabling nature of such injuries has been abundantly shown elsewhere in this brief. (See pp. 88-90.) Moreover, reference is made here to the point developed below that many of the manual reverse casualties shown on the form T reports are much more serious and disabling than the carriers' reports disclose.

As to the accidents which the court indicates were the result of indiscretions or neglect on the part of the operator, reference is made to the finding of the Commission on this subject (R. 56), that—

> "However, in actual operation and with the varied and frequent movements which the engineer is required to make in order to perform his duties properly, he cannot constantly keep clear of the reverse gear in the cab. In theory this might be possible, but in actual practice it cannot reasonably be expected. The engineer or other person operating the locomotive is as a matter of actual fact constantly subjected to whatever hazard exists in operating the hand reverse gear and under many circumstances he has no way of effectively guarding against injury."

and to the evidence elsewhere cited in this brief (see pp. 94-96), which amply supports this finding of the Commission.

As to the number of manual gear accidents attributed by the court to failure in maintenance and inspection of

the gears, amply shown of record, attention is called to the fact that such failure of maintenance appears to be chronic and proper maintenance improbable of accomplishment, for the carriers since 1915 have been subject to the existing rule which requires the manual gear to be properly maintained. Moreover, as shown above, even when the manual gear is properly maintained serious accidents inevitably happen.

As to the nine deaths and other injuries attributed by the court to the use of power gears, it has been shown heretofore that for the most part such injuries are not properly attributable to the gear, and are of a different kind than those sustained in the use of manual gear which are directly attributable to the gear and which disclose a constant and continuing peril to the engineer while engaged in his duties of operating his train.

In referring to the two hundred sixteen injuries on form T reports as being minor in character, the court states that in only three of them was the injured person off duty more than sixty days. How incorrect this finding is is shown by the fact that these reports on their face disclose six cases of more than sixty days disability, and there are ten additional cases where the disability was estimated at sixty days. The exhibit discloses thirty-nine additional cases where disability was given of between 30 and 59 days.

Further suggestive of the error of the court's statement are the instances shown in the record where the carrier in making such accident report has grossly understated the extent of disability. In the case of Engineer Adams, the accident report shows a probable disability of 25 days. (R. 1484.) This engineer was a witness and testified that he was off duty 7 months on account of this accident. Similarly in the case of Engineer Brown, the report disclosed a probable disability of 61 days, whereas, the witness testified he was off duty 5 months, that his injured arm is a little shorter than the other. (R. 291.) Again, Engineer Kinnard, whose accident report specified only a

severe abdominal strain causing 45 days actual disability (R. 1456), testified that the muscles and ligaments had been pulled loose from his pelvic bone and he still felt the effects of his injury. (R. 387.)

Thus, the evidence of three of the nine engineers who testified orally to the happening of accidents covered by these reports, shows that the carriers, as might be expected, minimized their estimate of the engineers' disability in making these reports.

The finding of the court that the Commission gave no effective consideration to the comparatively more serious character of the casualties resulting from the use of power equipped locomotives, is negatived both by the Commission's findings and the evidence in support thereof. The Commission states in its report: (R. 55)

> "Most of the accidents reported as due to hand reverse gears occurred to employees while handling the gear, whereas, only a small percentage of the accidents attributed to power reverse occurred to men operating the reverse gear, the others having occurred to persons on, around or in the path of the locomotive."

Having thus referred to this class of power reverse accidents, which includes all of the fatalities and nearly all other injuries shown on power reversed engines, and elsewhere in its report having carefully stated the various contentions of the carriers, the Commission then finds: (R. 58-59)

> "Clearly the carriers of this country would not have equipped approximately 29,000 locomotives with power reverse gear, and would not contemplate so equipping practically all new locomotives, if such gears did not contribute to efficiency of locomotive operation, or if power reverse gear is less safe than hand reverse gear. The fault termed 'creeping' causes no accidents and resolves itself largely into a question of proper maintenance. If the power reverse gears are properly maintained, we think 'creeping' to any mate-

rial extent will be eliminated. As to the ability to detect an obstruction in the valve gear, such as a man's head or arm, by the resistance offered to movement of the hand reverse gear, in time to avoid injury, we do not think such a theory is sound. The matter of power reverse gears becoming inoperative while on the road, due to loss of air pressure, can be taken care of by properly applied and maintained steam connections. As to locomotives moving unexpectedly, and crashing through roundhouse walls or into turntable pits, it is common knowledge among railroad men that such movements are not confined to locomotives equipped with power reverse gear but have also occurred on locomotives equipped with hand-operated reverse gear. Several of the accidents and much of the trouble set forth in the record as occurring on locomotives equipped with power reverse gear occurred on locomotives equipped with what are now obsolete installations. The difficulties encountered on such locomotives cannot be reasonably expected with modern installations."

These findings definitely show the deliberate weighing and rational disposition by the Commission of the carriers' contentions. Thus, as found by the Commission, the situation is that, first, nearly all of the accidents attributed by the carriers to the power reverse gear are not properly attributable to the gear, and, second, they are of a class avoidable by the exercise of ordinary care and the enforcement of proper operating rules and practices. On the other hand, the manual reverse injuries shown in the record are directly attributable to the use of the gear and cannot be averted by the degree of care which may reasonably be expected of engineers under actual operating conditions. Upon the evidence and the reasoning disclosed in the Commission's report, it seems clear that the court has substituted its judgment on this point for that of the Commission upon matters as to which the Commission had substantial and preponderating evidence in support of its findings and conclusions.

FINDING 4, Subdivision (j):

> (j) Power reverse gears were neither developed nor applied to promote safety. They have been preferred by the carriers because of restricted cab space in the more modern locomotives of enlarged boiler capacity. They take up little room in the cab and may be readily installed in such limited space, where it would be awkward if not impracticable to use the hand lever. Increased width of fire box and boiler head and increase of appliances for use by the enginemen are features of design increasingly present within recent years. The preference of the carriers for power gears on their modern locomotives is due to these modern conditions, rather than to promote safety, and is no evidence of their insincerity in opposing complainants' demands. In several respects power reverse gears do not make for safety as much as does the hand reverse gear, although the locomotive equipped with either type of gear properly installed and maintained is in proper condition and safe to operate without unnecessary peril to life or limb. (R. 221.)

The court here gives effect to the contention of the carriers that the reason for the widespread adoption of power reverse, resulting in the equipment of about 40,000 engines with this type of gear, is that there is not sufficient room in the cabs of modern engines to accommodate the manual lever. The complete error of this statement is demonstrated by an analysis of evidence of record relating to the equipment of the various types and sizes of locomotives. Exhibit 10 (found in Volume of Special Exhibits); Exhibit 58, (R. 1501-1535).[1]

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[1] Exhibit 10 is a summary of the reverse gear situation on Class 1 roads showing, first, the situation by individual roads, and, second, the situation on all roads by weights on drivers in 50,000 pound graduations. Exhibit 58 comprises the underlying data from which Exhibit 10 was drawn off. It shows the detail of engine weights and classes as to each road.

Turning to Exhibit 58, if a given road is singled out and the detail by weights on drivers of its locomotives is examined, numerous instances will be found where out of locomotives of a given weight some are equipped with manual reverse and others with power reverse. For example, taking the Delaware & Hudson, it appears that of 106 road engines owned by it weighing 209,600 pounds on drivers, 53 are equipped with manual gear, and 53 with power gear; and that of 75 road engines weighing 236,400 pounds on drivers, 43 are equipped with manual levers and 32 with power gears. (R. 1512.)[1]

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[1] Other examples are:

R. R. Initials	*Service*	*Weight on Drivers*	*Hand*	*Power*
A. T. & S. F. (R. 1880)	Road	167,500	97	72
"	"	216,600	19	35
"	Switch	216,600		8
"	Road	150,500	4	2
"	"	168,100	3	20
"	"	138,500	1	3
C. & O. (R. 1506-7)	Switch	142,300	5	3
"	Road	157,200	3	24
"	"	168,500	10	33
"	"	163,900	58	57
"	"	173,600	2	12
"	"	176,150	14	25
"	"	178,400	13	36
N. Y. C. (R. 1521-2)	Switch	163,500	4	229
"	"	147,000	6	3
"	"	152,000	38	38
"	Road	159,000	85	1
"	"	213,900	89	29
"	"	215,000	33	37
"	"	216,300	25	1
"	"	175,000	9	65
"	"	173,400	5	68
"	"	172,600	108	48
"	"	170,500	29	3
Southern Ry. (R. 1530)	Road	151,000	9	10
"	"	152,000	39	53
"	"	182,000	46	368
"	"	215,700	12	170
"	Switch	145,000	18	143

Treating the entire exhibit in the same manner as the cases shown in the foregoing footnote, we find 171 such instances on 65 roads. These 171 instances include 8,609 locomotives of which 4,383 are equipped with manual levers and 4,226 with power gears.

The situation is further shown on Sheet 4 of Exhibit 10 (Volume of Special Exhibits), as follows:

Weight on Drivers (Pounds)	*Total Number Steam Locomotives*	*Number Equipped with Power Reverse Gears*	*Number Equipped with Manual Levers*	*Number Programmed to be equipped with power gears*
100,000 to 150,000	13,172	1,821	11,314	283
150,000 to 200,000	18,342	7,186	11,000	869
200,000 to 250,000	16,042	11,422	3,351	366

Thus, on the heavier and more powerful locomotives weighing from 200,000 to 250,000 pounds on drivers, a substantial number (3,331) are equipped with hand levers, while on the smaller locomotives weighing from 100,000 to 150,000 pounds on drivers, a substantial number (1821) are equipped with power gears. As to these lighter locomotives no claim can be made that power gears were used because they were "the more modern locomotives of enlarged boiler capacity * * * where it would be awkward, if not impracticable, to use the hand lever."

Moreover, the program of the carriers calling for the installation of power gears on 1529 locomotives which are at present equipped with manual gears, as shown in this exhibit, is further proof of the fact that the reason for applying this type of gear is not because the locomotives cannot accommodate the manual lever.

There is, however, further significance in the court's observation that power gears are preferable because they take up little room in the cab, in cases where it would be

awkward, if not impracticable, to use the hand lever. This consideration, of course, goes directly to the subject of safety, for the relation of close clearances and the awkward handling of the lever, to hazards of operation have been abundantly shown. Indeed, one of the officers of the Illinois Central testified that close clearances around the manual lever was a sufficient reason which lead his road to take off a large number of manual gears and substitute power reverse therefor (R. 1188), and that of the 1540 power reversed locomotives of his road, not more than 200 are so designed that a manual lever could be used without making it awkward and inconvenient. (R. 1185.) As appears from Exhibit 58 (R. 1516), all but 19 of the locomotives owned by the Illinois Central within the weight limitations of the Commission's order (or 98.8% of the total subject to the order), are equipped with power gears. If, therefore, clearance conditions on the Illinois Central are such as to warrant the installation of power gears on practically all of its engines, the Commission would appear to be justified in requiring other roads to meet the standard thus voluntarily set by this road.[1] From the testimony shown of record it cannot be assumed that clearance conditions on other roads are substantially different from clearances on the Illinois Central locomotives.

As to the statement of the court that power gears were neither developed nor applied to promote safety, instances

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[1] Illustrative showing of other roads:

Railroad	*No. subject to order*	*Power gears*	*Percentage of Power Gears*
A. C. L.	358	338	94.4%
A. T. & S. F.	1755	1428	81.3%
C. C. C. & St. L. (NYC)	925	833	90.0%
C. & O.	1062	956	90.0%
Fla. East Coast	191	191	100.0%
Southern Ry.	1496	1372	91.7%

are shown in the records of demands by the Brotherhood for equipment of manually reversed engines with power reverse, such demands being based on the hard-handling on the manual levers (R. 1198, 1230), which of course, goes to the question of safety.

While the carriers asserted that their increasing use of power gears was entirely innocent of any thought that safety would be promoted thereby, it is noteworthy that at the 1929 convention of Road Foreman of Engines a report was made by a committee composed of officials from six important carriers, in which it was stated that power reverse gear enables the engineer to change the cutoff regardless of speed, which cannot be done easily with the old reverse lever.[1] The significance of this statement is apparent when the hazard of hooking up or dropping down the lever is recalled from the evidence of record.

Moreover, the record discloses (R. 1276) that the Chief Inspector of the Bureau of Locomotive Inspection in his annual report for several years in succession recommended that a rule be adopted requiring power reverse gear on all locomotives. In view of the purpose of the Act and the duty imposed upon him by Section 7 thereof to include in his annual report such recommendations for the betterment of the service as he may desire, it must be concluded that such recommendation was made in the interest of

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[1] The Chairman of this committee testified as follows:

"Q. Will you read into the record what this paragraph is?
A. You want me to read that all?
Q. Yes.
A. All right. 'Power-reverse gear assists the engineer to use each pound of steam to the best advantage by holding the cut-off in the desired position and making it free for the engineer to change the cut-off regardless of speed, which cannot be done easily—' I want to emphasize that word there 'easily'—'which cannot be done easily with the old reverse lever. This appliance has also added to the efficiency of the locomotive in switching service.'" (R. 1370.)

promoting safety. The carriers surely are conversant with the recommendations of the Chief Inspector.

Finally it seems clear that the Commission in passing upon the conflicting elements of the evidence, and particularly in weighing the carriers' contentions that in some respects power gears are less safe than manual gears, was bound to consider, and did consider, the fact as stated in its report (R. 58), that

> "Clearly the carriers of this country would not have equipped approximately 29,000 locomotives with power reverse gears, and would not contemplate so equipping practically all new locomotives, if such gears did not contribute to efficiency of locomotive operation, or if power reverse gear is less safe than hand reverse gear."

As further stated in the report (R. 59):

> "Witnesses for the carriers, who were asked the question, were firm in their opinion that we should not require power reverse gear to be removed from present locomotives and hand operated gears used in lieu thereof." (R. 1186, 1287, 1111, 1266.)

Carrier officials were further firm in their statements that in ordering new locomotives they intend to continue to specify power reverse gears. (R. 1005, 1007, 1258, 1290.)

FINDING 4, Subdivision (k):

> (k) Complainants' evidence before the Commission shows an average of one injury for each 25 years of active service, and but two of these were serious enough to permanently retire the engineer. 125 witnesses for defendants with an aggregate of 3,852 years of locomotive service suffered four minor injuries or an average of one for each 963 years of service. The 216 form T report injuries applied to 31,597 manually equipped engines during 1929 and 1930 show an average of one accident per year for approximately 300 locomotives. (R. 222.)

The statistics here used by the Court do not take into consideration the fact that only a portion of the 31,597 manually equipped engines were in service during the two year period for which the 219 manual gear casualties were reported. The Commission's report (R. 59) lists 16,282 locomotives stored in serviceable condition or out of service undergoing or awaiting repairs at the time its last annual report was issued, a large percentage of which are manually reversed engines. It furthermore appears that in recent years there has been an increasing proportion of power geared engines used in comparison with those manually equipped, the carriers evidently preferring to use their most modern and efficient locomotives, which for the most part are equipped with power gears, in times of depressed traffic.[1]

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[1] On the Erie in 1928, the mileage for power reversed engines, was 16,571,408 and for hand reversed engines 12,190,996, while for 1929, the mileage for power reversed engines was 18,-682,239, and for hand reversed engines 11,003,723. (R. 1263.)

Superintendent of Motive Power, Ward, testified that the percentage of Burlington locomotives in active operation equipped with power gears is greater than the figures (of locomotives owned) indicate, because a number of manually equipped engines are not in service (R. 1283); that owing to the progressive equipment of the road's switch engines with power gears, only a few of the lighter classes of switch engines will be in service in a short time; that of its road freight engines above 152,000 pounds on drivers (approximately the line of demarcation set by the Commission), all but 17 are now equipped with power gears; and that all passenger locomotives above 165,000 pounds on drivers are equipped with power gears. (R. 1284.)

Asst. General Supt. of Motive Power, Burnett, of the Union Pacific, testified that a large percentage of hand reversed locomotives are out of service at the present time and in storage, which accounts for the small number of hand gear arrivals as compared with the power gear arrivals in the same month (March, 1931). (R. 1129.) Exhibit 56 shows that in March, 1931, there were 301 manual engines as compared with 1837 power reverse engines despatched at the Council Bluffs terminal. (R. 1500.)

Consequently, the ratio of hand reverse injuries to the number of manually equipped engines *actually used* is much higher than that stated by the court.

FINDING 4, Subdivision (l):

> (l) The more modern locomotives with wide fire boxes and limited cab room are the types where the principal difficulty in the matter of clearances has been experienced, but upon these types power reverse gears have already been voluntarily applied by the carriers. Improper clearances on manual reverse gear locomotives may readily and inexpensively be made ample by changing the location of appurtenances in the cab so as to provide more room. Accidents attributable to insufficient clearances which appear to constitute the majority of accidents relied on by complainants, are preventable thereby. (R. 222.)

The intent of the court's finding that power gears have already been voluntarily applied upon the more modern locomotives with wider fire boxes and limited cab room, apparently is to show that in all cases where limited clearance requires its use, power gear has been installed. The record, however, shows the contrary. Assuming, as the evidence indicates, that increase in the size of the locomotive is achieved at the expense of room in the cab, it is significant that 3,351 of the locomotives weighing between 200,000 and 250,000 pounds on drivers are still equipped with manual levers, although 11,422 have been equipped with power gears. (Sheet 4 of Exhibit 10, Volume of Special Exhibits.)[1] Moreover, of the locomotives weighing

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[1] Illustrative of the clearances on the larger manually equipped locomotives is the following testimony:

Snoddy, C. C. C. & St. L. "Our freight engines are 2-8-2's weighing from 200,000 to 246,000 pounds on drivers. (The 2-8-3 or Mikado type locomotives are modern engines of the type most commonly used in through freight service.) About half of them

from 150,000 to 200,000 pounds on drivers, as to which the carriers have deemed it necessary to equip 7,186 with power gears, 11,000 still remain with manual levers. The lack of clearance around the lever on these engines is amply shown of record. (See pp. 92-96 this brief.)

The suggestion of the court that improper clearances on manual geared engines may be readily made ample by changing the location of appurtenances in the cab is more simple of statement than application. There are three general locations in which manual levers are placed.

On many locomotives the lever is located alongside the engineer's seat box between the seat box and boiler with little or no clearance between the lever and seat box. These are wide firebox locomotives, and the fact that there is insufficient room between the boiler and the engineer's seat box to accommodate the lever, is shown by the fact that the seat box has to be dropped out of the way in order to reverse the engine.

A second location of the lever is ahead of the seat box between the boiler and the side of the cab, and when the lever is placed in back motion, it comes close to or against the engineer sitting on his seat box. It is not practicable to move the seat box back or the lever ahead so as to provide more clearance, for if that were done, the

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are power reverse and half manual reverse. * * * With reference to the manually reversed 2-8-2 freight locomotives, clearance is pretty close between the foot board and seat box, perhaps two or three inches. Some are closer than that. On some of them you cannot get your foot between the quadrant and seat box. When sitting on the seat box the room for your foot and legs ahead of the seat box varies. On some engines it is pretty close there, owing to the arrangement of the brake valves, independent valves and piping; your legs are close to those pipes. The lever sometimes goes down right against the boiler head. We usually put a stop block to catch the lever from going smash up against the boiler. The lever in full backward position usually goes out into the deck, usually past the rear end of the cab, and that is dangerous, for it is liable to catch your hand between the side of the cab and the lever." (R. 296.)

engineer would have to get up to reach his throttle and brake valve, and these devices could not be operated and signals watched conveniently. (R. 1395.)

On a third class of engines, the lever is located behind the boiler head and alongside the seat box, but in such cases clearance between the lever and the back board of the cab at the rear, and at the boiler head and its appurtenances at the front, is close. On such engines when the lever is placed in back motion it extends beyond the back board out into the gangway and is so close to the back board that a portion of the back board is cut out to accommodate the lever and the engineer's hand. These considerations were sufficient to lead the Illinois Central to remove the hand levers from such engines and install power gears. (R. 1178.)

Moreover, the suggestion of the carriers that a guard be placed about the quadrant to keep the engineer's feet from being caught was shown to be not practicable. (R. 258.) Likewise, an attempt to increase the clearance between the top of the lever and the boiler head or pipes by placing the stop block higher in the quadrant is impracticable, for to do so may result in taking away the full lead of the locomotive and making it logy. (R. 420.)

The relocation of pipes and appurtenances in the cab in some cases might gain an inch or two additional clearance, but this would by no means remove the hazard. As stated in the Commission's report (R. 55),

> "The space in which the engineer must work while operating the locomotive and while in his usual and proper position in the cab is quite limited. This is especially true on the larger and modern locomotives. On such locomotives he is likely to be struck by the hand lever if for any reason it suddenly moves. The fact that the hand reverse lever does suddenly move without warning to the engineer and from various causes, and that many injuries have resulted from

such movements of the hand lever, is clearly established by the evidence."

and again (R. 56)—

> "However, in actual operation and with the varied and frequent movements which the engineer is required to make in order to perform his duties properly, he cannot constantly keep clear of the reverse gear in the cab. In theory, this might be possible, but in actual practice it cannot reasonably be expected."

The apparent remedy lies not in attempting to gain a few inches of additional clearance by relocating the lever or the appurtenances in the cab (the carriers having had so many years experience with the problem that it is to be presumed that they have in general already obtained the maximum possible clearance) but in removing this dangerous instrumentality from the cab.

FINDING 4, Subdivision (m):

> (m) The manually operated screw reverse gear occasioned fewer accidents than any other type, and no evidence is in the record tending to prove that such gear is unsuitable or unsafe. Approximately 1,550 locomotives are so equipped. The evidence shows only three minor accidents in connection therewith in 1929 and 1930. (R. 222.)

Considering that less than 3% of the locomotives involved in this proceeding are equipped with manual screw reverse, it is to be expected that the fewest accidents should occur from its use. The basic element of danger in manual screw gear lies in the fact that the wheel in the cab, like the manual lever, is directly connected to the valve gear and valves. Consequently, in handling the wheel the engineer is subjected not only to the strain of moving the heavy parts, but also to the stresses set up by the reciprocating action of the valve gear and valves when the locomotive is in motion. The severe force directly communicated to

the manual screw in the event of any disturbance in the valves or valve motion is illustrated by the accident to Engineer Hurd.

While running in a backup movement with his hand on the wheel, the bracket studs holding the screw reverse guide to the side of the boiler pulled out of the boiler, and the reversing gear and wheel went up to the top of the cab. These studs were fastened into the boiler and when they pulled out, hot steam escaped from the stud holes. Hurd and the fireman and brakeman jumped twelve or fourteen feet to the track below, but were badly scalded. (R. 275.) The strain to which the gear wheel had been subjected is shown by the fact that of the six one inch studs, two had been pulled out of the boiler, one broken off, one cracked 75%, one cracked 25% and one bent. The report of the Bureau of Locomotive Inspection stated:

> "The cause of the accident was that the piston valves were dry and stuck due to lack of lubrication, throwing excessive strain on studs securing screw reverse support to the boiler, pulling out two studs." (R. 1406.)

Engineer Hurd testified:

> "I do not think if we had had the precision (power gear) screw any one of us would have been hurt on the occasion described, because it would have torn off outside where the air cylinder is connected to the reach rod." (R. 275.)

Engineers are likewise subjected to unnecessary strain in reversing the screw gear. As stated in the record,

> "if the gear is up in perfect condition it works plenty hard, but if you have a screw that is bent a little and the cross-head has to work over there, it is impossible to get it over. If your guides are too tight on the crosshead, they work hard. If your valves are a little dry, if the tumbling shaft boxes are a little tight, then it works hard. In the best of condition they work

plenty hard. They have two jam nuts at the back end of the box where the shaft goes through to the wheel, and sometimes these jam nuts work up and have to be loosened with a hammer." (R. 274.)

It was further testified that,

"They have some that you could turn with one hand, but again, you might run that engine for four or five hours on your trip and finally it would get so you could not turn it with both hands, or it would be all you could do to get it over with both hands." (R. 267.)

The gear moreover, is slow to operate requiring as many as twenty-one turns of the wheel to reverse the engine (R. 274), and the engineer cannot take his time in turning the wheel for "everything in our service is production now," (R. 266.) The conditions under which engineers are required to work with the manual screw (and the same thing may be said of manual levers) (R. 255) is thus described,

"I was injured by operating a manual screw reverse on a work train, engine No. 3064, an N-1 Mikado with Baker valve gear, weighing 238,000 pounds on drivers. It had come from the shop after class 4 repairs. I told them it was not fit to take out and they said it was the only engine they had and I should take it. You could hardly reverse it. When we were at work, the supervisor bawled me out for not handling it right. At noon I called him on the engine and he couldn't budge the wheel. The fireman handled her; I couldn't handle her any more. I couldn't get off my feet after a while. I had strained my hip reversing it. It had worked so hard." (R. 277.)

The witness was off duty one hundred one days. He further stated:

"The sprain was due to pulling hard on the wheel that you reverse the engine with. You couldn't turn the wheel without jerking it. You jerked it a notch or two at a time it worked so hard. I had my feet on the

floor and used all of the strength I could pull with." (R. 278.)

In another instance, causing a hernia and consequent operation with three months disability, the engineer testified:

> "I do not know what caused the wheel to work hard on that occasion any more than at any other time. It had worked hard all night. The wheel did not catch me. The strain that was on the lower part of my abdomen caused the hernia, and the pulling of this wheel caused the strain." (R. 267.)

It is significant that on the Erie this type of gear has proved impracticable and is being removed and power gears are being substituted therefor. (R. 276, 1266.)

FINDING 4, Subdivision (n):

> (n) But three injuries are shown of record on locomotives equipped with obsolete types of power reverse gears. Many accidents occurred in connection with locomotives equipped with power gears of the latest type, which operate on the same general principle as the earlier types. (R. 222.)

In stating that but three injuries are shown of record on locomotives equipped with obsolete types of power gears, the court refers to accidents to the *man in the cab* while operating the gear. Instead of three, six such casualties appear of record,[1] these casualties constituting approximately one-third of the total casualties of this sort on power reversed engines.[2]

In other cases not noticed by the court, injuries were shown as far back as the years 1913 (R. 692), 1916 (R.

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[1] Mellin gear. (R. 353, 1246, 1447.) McCarroll gear. (R. 768) two cases. Unnamed gear. (Evidently Mellin.) (R. 1458.)

[2] Eleven such injuries appear from oral testimony and nine from Form T reports.

1142), and 1917 (R. 691) with an obsolete type of Ragonett gear. (R. 1376, 1377.) [1]

Moreover, power gears not equipped with properly applied and maintained steam connections are, in that respect, "obsolete." As heretofore shown, the difficulty appearing in instances where the air supply was lost on locomotives running light. Insofar as the failure of the gear to function was concerned, was due to the carriers' failure to equip their gears with this auxiliary.

As to the accidents on locomotives equipped with gears of the latest type, it has been shown that for the most part such accidents occurred when the gear was operated by someone in the cab, in violation of operating rules, at a time when another employee was working about the valve motion and that such accidents are not properly attributable to the gear which performed only as could be expected.

FINDING 4, Subdivision (o):

> (o) Many of the most severe injuries to employees working outside the locomotives were due to eccentricities and trickiness of operation of power reverse gears caused by their intricacy, or temporary insufficiency of power available on the engine, the latter being a circumstance not always detectable. From these conditions dangers arise to passengers and the general public, and not only to the enginemen. (R. 222.)

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[1] As an illustrative instance: An engineer was having difficulty with a creeping Ragonett gear in 1917 and attempted to repair same by mixing up some black oil and water and pouring it into the gear cylinder, in order to soften up the piston gasket. When he turned the air back into the gear while standing on the frame, his foot was caught by the machinery as it readjusted itself. (R. 691.) A square soft packing was being used in the Ragonett gears at that time but it has since been replaced by cup-packing, which permits easy examination for leaks and a ready means of oiling the cylinder. (R. 1376, 1377.)

What the court calls "eccentricities and trickiness of operation" of power gears is shown, in the main, to be only the designed action of the gear in readjusting itself when the air supply is readmitted to the gear cylinder. (Examples, R. 691, 718, 1138, 1154.) No accidents or any dangers were shown to anyone other than the employee who places his hand or arm in the valve motion when such readjustment occurs.

As to the alleged hazard of a temporary insufficiency of power to operate the gear, which the court states is not always detectable, the use of an indicator which shows whether the gear has responded to a movement of the control lever obviates this criticism. (R. 643.) The fact that no casualties attributable to this source were shown since isolated cases in 1916 indicates that with the observance of proper operating rules and practice (R. 643, 1228) such accidents are now being avoided. Since in such cases the locomotive is usually standing in or about the roundhouse, danger to passengers and the general public are remote. (The cases of runaway light locomotives have been sufficiently discussed heretofore to show that the absence of properly applied and maintained steam connections was the fault.)

FINDING 4, Subdivision (p):

> (p) Both types of gears have been in use by the railroads for more than twenty years. And prior to the complaints no claim was made by complainants, carriers, or manufacturers of power reverse gears, that the substitution of power for the hand reverse gear would promote safety.
>
> Considering the number of locomotives in operation, the possibility of accident through the use of hand reverse gear equipment is slight and the risk of serious injury thereby very remote. The use of this type of equipment is not attended with any unnecessary peril to life or limb.

> The conclusion of the Commission that safety of employees and travelers on railroads requires steam locomotives to be equipped with power reverse gear is substantially unsupported by the evidence before it. (R. 223.)

Illustrative instances of the Brotherhoods' request for the equipment of manually reversed engines with power gears, based on the hard handling of the manual gears, a consideration going directly to safety in operation, were shown of record (R. 1198, 1230) although it was not deemed necessary to prove what the claims of the parties or the manufacturers had been. (The manufacturers were called to testify only to the mechanical construction of and changes in their gears.) However, the repeated recommendations of the Chief Inspector of the Bureau of Locomotive Inspection for the adoption of a rule requiring power reverse on all locomotives (R. 1276) leaves no doubt as to what expert and unbiased opinion on this subject was.

As to the ultimate issue of whether the safety of employees and travelers on railroads requires the locomotives specified in the Commission's order to be equipped with power reversed gear, the question of fact presented for the Commission's determination, as stated in its report, (R. 51) is "whether the use of locomotives equipped with hand reversed gear as compared with power reversed gear causes unnecessary peril to life or limb."

That this problem was one appropriate to the relief granted by the Commission is shown by the facts that since 1915 more accidents have been traceable to the reversing gear than any other type of accidents investigated by the Bureau of Locomotive Inspection, save two (R. 1263, 1398); that in the five-year period from 1926 to 1929 inclusive, there were 1116 casualties (R. 54) *to men in the cab injured in handling the reversing gear while operating the locomotive and/or train;* that the proportion of such 1116

casualties occurring from handling manual gears is illustrated by the fact that of 232 such cases occurring in 1929 and 1930 a total of 219 occurred on locomotives equipped with hand reverse gear and 12 on locomotives equipped with power reverse gear (Ex. 13, R. 1420-1486, 1499); and that giving effect to such proportion it appeared that approximately 1055 such injuries occurred on manually reversed engines during said five-year period.

The many respects in which safety is promoted by the use of power instead of manual reverse gears is clearly shown of record, as has been demonstrated elsewhere in this brief. Accidents of the kind included in the aforementioned 1116 casualties have been practically eliminated by the use of power gears. Not only are the cab-stationed operators of the gear protected from physical injury, but also the safety of travelers upon railroads is promoted by making it possible for those in charge of locomotives to perform their duties free of injury, or apprehension of injury (R. 314), while handling the reversing gear. Moreover, the use of power gears generally promotes safety by relieving the enginemen of excessive fatigue (R. 359, 345), and by promoting their comfort thereby enabling them better to keep a proper look-out and perform their other duties. (R. 259, 262, 274.) (*Cf. Napier v. Atlantic Coast Line, supra,* page 611.)

The evidence of accidents on power reversed engines relied on by the carriers is different in kind and quality from the showing of casualties directly due to the operation of manual gears. As heretofore shown, such casualties on locomotives equipped with power gears were, for the most part, not attributable to the type of gear employed, and furthermore were avoidable by the enforcement of proper operating rules or the exercise of ordinary care on the part of employees, which was not true of the manual gear casualties. This was a situation calling for the ex-

pert judgment and determination of the Commission, the administrative body to which, as this Court has stated in the *Napier Case* belongs the duty of prescribing the rules and regulations by which fitness for service of the locomotive and its appurtenances shall be determined.

The court has erroneously come to a conclusion opposite to that of the Commission upon the ultimate question of whether the safety of employees and travelers on railroads requires the locomotives specified in the Commission's order to be equipped with power reverse gear. The Commission's order, as will be shown in Point III of our argument, was amply supported by the evidence. No arbitrary action on the part of the Commission was shown, and it was error for the court to substitute its judgment for that of the Commission.

FINDING OF FACT NO. 5.

> The report shows on its face that the Commission failed and refused to consider uncontradicted evidence submitted by the railroads of their precarious financial condition and the necessity of conserving their cash and credit to meet current operating expenses and fixed charges in order to continue to maintain and operate their properties with safety to their employees and the public. The Commission failed to give heed to the outstanding facts of the general depression and the inroads upon railroad revenues of motor and water competition; it failed to consider difficulties of financing under such circumstances and the cost of complying with the order, and expressly grounded its order upon expected future improvements and financial conditions not shown of record or true in fact. (R. 223.)

Contrary to this finding, the report shows that the Commission carefully considered the evidence relating to

the financial condition of the carriers. It expressly stated its concern over the problem:

> "Nor are we unmindful of the financial condition of the carriers, which was strongly urged as a reason for denial of the relief here sought." (R. 60.)

This is emphasized by its rejection of the recommendation in the Examiner's proposed report (R. 194), that:

> "The question of financial ability to apply the requested equipment cannot, as a matter of law, properly have any bearing upon the decision of the Commission in this case."

In dealing with the problem, the Commission further said (R. 59):

> "The occurrence of accidents in actual operation of locomotives equipped with hand reverse gear is clearly shown of record. There is a further question before us as to the extent to which the use of any or all steam locomotives equipped with hand reverse gear causes unnecessary peril to life and limb, and whether the application of power reverse gear should be required on all locomotives at this time.
>
> To draw a line of demarcation *which will provide the degree of safety contemplated by the law and yet not cause unnecessary expense on the part of the carriers* is not easy. While the accident records do not in all cases show the size of the locomotives on which accidents have occurred, they do indicate that the greater number occurred on the heavier types. This results from the difference in size and weight of parts which must be controlled and operated by the reverse gear, and from differences in speed and cab clearances and in other conditions encountered in the actual operation of locomotives."[1] (Italics ours.)

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[1] The premise underlying the Commission's differentiation between light and heavy locomotives was suggested by the carriers themselves. In their original answer the carriers represented by the American Railway Association pleaded (R. 28): (Continued on page 77.)

While, as suggested by the Commission, the drawing of a line of demarcation was not easy, there was abundant justification for the line drawn in the showing from Exhibit 10 (Special Volume of Exhibits) and other evidence, that the carriers had already equipped with power gears large number of their locomotives above the weights designated by the Commission. The action of the Commission in thus rationally drawing a line of demarcation clearly indicates its regard, not only for the requirements of safety, but for the financial condition of the carriers.

"These Respondents say, in answer to the allegations of the Complainant, that, *while power reverse gears are suitable and useful in connection with certain classes of locomotives, this is not true of all classes,* and that for locomotives in such last mentioned class there is no necessity for such equipment. It is the policy and the practice of these Respondents to equip all new locomotives of the classes where such gears are appropriate with power reverse gears, and they have so equipped a large number of their locomotives of this class which were already in service. There are many cases, however, in which locomotives will soon be cut up and disappear from the service, and there are others engaged in such a class of service as to obviate the necessity for the use of power gears." (Italics ours.)

In the answer of the American Short Line Railroad Association other carriers pleaded (R. 44):

"The defendants named in Appendix allege and show to the Commission that the steam locomotives operated by them are small, being in all cases greatly less than the *weight and size* of locomotives used on the lines of major carriers, and that such engines are run at a slow speed and for such limited distance and with such light tonnage as that they are entirely safe and adequate as now equipped and the manually operated reverse gear in use by them is not heavy or difficult to use and is not beyond the strength of the engineers to operate and does not and cannot subject such engineers to undue fatigue and physical strain." (Italics ours.)

The position of the Delaware & Hudson on this subject was stated as follows:

"In this situation, it is the view of the management of the Delaware & Hudson that (1) power reverse gears may be applied to certain types of *heavy* motive power advantageously when its earnings permit expenditures on projects which are desirable but not essential, in the interest of safe and efficient operation of the properties." (R. 685.) (Italics ours.)

The Commission refers to another practical consideration which materially affects the financial outlay required by the order. It will be borne in mind that the Act affects only such locomotives as are actually *used* in the service of the carriers. In the report (R. 59), the Commission said:

> "As a practical matter we are, in the main, looking to the future in the consideration of this case. The rule established herein with respect to locomotives now owned by the carriers is that those having more than a specified weight on driving wheels be equipped with power reverse gear when they are shopped for class 3, or heavier, repairs. Our last annual report shows that there were at that time 9,840 locomotives stored in serviceable condition and 6,442 others out of service undergoing or awaiting repairs. A large percentage of these locomotives is equipped with hand reverse gear. Whatever expense results from these applications will be distributed among a large number of carriers and spread over a period of approximately four years. A large number of the locomotives equipped with hand reverse gear are now set aside awaiting disposition and will never again be used. Many of the locomotives in service with hand reverse gear will be dismantled before they are again given class 3, or heavier repairs."[1]

---

[1] The record situation with respect to the number of locomotives out of service is shown by the following evidence.

On the Erie, out of 435 hand reversed engines owned in December 31, 1930 (R. 1263), 195 were out of service on August 28, 1931. (R. 1323.)

Data from the Delaware and Hudson shows that in 1931 of 439 locomotives owned, 148 were stored. (R. 685.)

The percentage of Burlington locomotives equipped with power gears which are in active operation is greater than the figures of locomotives owned indicate because many of the manually equipped engines are not in service. (R. 1283.)

A large percentage of the hand reversed locomotives of the Union Pacific are out of service at the present time and in storage. This accounts for the small number of hand geared engine arrivals as compared with power geared engine arrivals in March 1931. (R. 1129.) (Exhibit 56 shows that in March 1931, there were 301 manual engines as compared with 1837 power geared engines despatched at the Council Bluffs terminal.) (R. 1500.)

While it is true that compliance with the Commission's order will entail some expense (which in a large part may be offset by increased efficiency resulting from the use of power gears [1]), yet the actual expenditure does not bulk large in terms of railroad finance, particularly in view of the fact that the cost will be spread over a number of years. It would seem that the balancing of the requirements of safety imposed by the Act against the cost thereof and the financial condition of the carriers is a mixed question of the very kind which should be left to the Commission, which, it must be admitted, is "informed by experience" with each of these factors.

Taken as a whole, the Commission's statement of its conclusions upon the carriers' plea of financial distress is impressive of the fair and considerate treatment accorded the carriers, and no arbitrary action appears.

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[1] *Cf.* the report of carrier officials at the 1929 Convention of Road Foremen of Engines. (R. 1370.)

III. THE COMMISSION'S ORDER WAS SUPPORTED BY SUBSTANTIAL EVIDENCE.

The Commission's report contains a comprehensive statement of its conclusions and the reasons therefor. As will be seen from the report, the Commission gave full consideration to the evidence and the claims of the parties with respect thereto. Under point II of our argument we have referred to the statements in the Commission's report disposing of the contentions of the carriers, and we have there set out the evidence supporting the Commission's conclusions. It was shown that there was substantial, even though in some cases conflicting, evidence in support of the reasoning and the conclusions of the Commission expressed on such subject. The further conclusions of the Commission upon which its order was grounded will be dealt with below.

The Commission's order was based not only upon the accident evidence shown with respect to both types of gear, but also upon the actual operating conditions which give rise to such accidents. The first striking difference between the gears is that of mechanical design. As stated in the report (R. 53):

> "On locomotives equipped with hand-operated reverse gear the engineer, or other person operating the locomotive, moves the reach-rod and other parts of the reverse gear, as well as the valve gear, by moving the reverse lever or wheel in the cab." (R. 238, 239, 267.)
>
> "On locomotives equipped with power reverse gear the reach-rod is moved by power derived from an air cylinder and piston, or equivalent mechanism, the engineer merely moving the valve, which controls the flow of air, by means of a small lever or wheel in the cab." (Ex. 14, 15, 16, 17, Separate Vol. of Exhibits, R. 243, 256, 261.)

It follows, of course, as the Commission stated (R. 54) that on a manually equipped locomotive whatever force is

necessary to remove the reverse lever must be exerted by the person operating the locomotive, while on power reverse locomotives, the necessary force is exerted by air or steam pressure. Thus, with manual gear, as stated in the report (R. 53):

> "Friction between certain parts of the reverse gear, and of the valve gear, and between parts of the valves and the steam chests, as well as the weight of the parts, whether or not counterbalanced, makes it necessary that considerable force be exerted in order to move the reverse gear. The force required is increased if there is steam in the steam chests and cylinders, and varies also with speed and with the tractive effort being developed by the locomotive, and because of several other conditions which arise in practical operation."

(R. 254, 260, 263, 264, 266, 267, 271, 272, 274, 277, 278, 280, 281, 285, 293, 296, 303, 306, 317, 321, 328, 334, 337, 344, 347, 349, 360, 353, 354, 365, 362, 366, 368, 369, 370, 373, 377, 386, 388, 390, 393, 394, 397, 401, 416.)

The parts of the manual reversing gear required to be moved by the operator thereof, whether in reversing the engine, or in adjusting the cut-off while the locomotive is running over the road, weigh approximately 2000 pounds. (R. 1296.) While a counter-balance spring, designed to balance the weight of these parts, is employed, there is a limit to the tension it exerts, and it does not balance the weight at all points in the throw of the lever to the same extent. (R. 249, 1298.) The number of bearings involved in these parts ranges from 15 to 17. (R. 241, 277.) If such bearings become dry, or are tight or out of alignment, the gear handles hard. (R. 240, 241, 245, 272, 274, 275, 277, 397, 401, 416, 1140, 1152, 1195.)

The engineer who breaks in the locomotive after it has undergone repairs, and comes out of the shop with the bearings and connections tight or stiff is significantly termed a "lion-tamer." (R. 432.)

The counter-balance spring sometimes is improperly adjusted, or breaks, making it additionally difficult to handle the gear (R. 358, 359, 360, 394, 397, 440), and breakage of strips, rings or the yoke in the valve chamber has the same result. (R. 280, 297, 452, 661.) In cold weather the lubrication of the various bearings stiffens and congeals and frost or snow gathers in the working parts making the gear more difficult to operate than in warm weather. This effect is noticeable at and below freezing temperature. (R. 302, 303, 334, 338, 344, 348, 349.)

The force normally required to reverse the engine or adjust the cut-off is increased if there is steam in the steam chests or cylinders (which resists the attempted movement of the valves and parts). (R. 240, 241, 253, 255, 264, 272, 274, 277, 353, 358, 369.) While cylinder cocks are provided to clear the cylinders of steam there are many places and circumstances where they cannot be used, because the escaping steam would strike men working around the engine, or passengers at stations or upon street crossings. At other times the cylinder cocks fail to open. (R. 250, 251, 264, 274, 277, 356, 358, 371, 395, 398.)

Moreover, in adjusting the cut-off with the locomotive in motion, the force required is increased with speed and the tractive effort being developed by the locomotive. (R. 1201, 1297, 1379.)

Another condition frequently encountered in the operation of locomotives is the condition known as "dry valves." Dry valves increase the difficulty of handling manual reverse. A variety of conditions cause dry valves; foaming water, leaky dry pipe, improper lubrication due either to the lubricator failing to feed or being fed too lightly, improperly fitted valve rings or valve or cylinder ring packing blow. The effect of dry valves is to increase the friction between the valve and its seat. The water in the boiler frequently foams or raises, and is carried along

with the steam into the valve chambers and cylinders, and washes away the lubrication of the valves and cylinders. As long as the engine is thus "working water" attempts to lubricate the valves by increasing the feed of the lubricator are futile. (R. 263, 264, 267, 311, 373, 277, 278, 280, 290, 297, 344, 358.)

In actual practice, the force required to handle the manual lever is illustrated by the fact that the carriers have installed foot braces at the forward end of the quadrant to assist the engineer in bracing himself when handling the lever. It is the common practice, whether or not such foot braces are furnished, for the engineer in handling the lever to press his foot against the boilerhead or various pipes in the cab as a precaution against being jerked. Even when the engineer is so braced, the lever handles hard and frequently gets away from him. The following excerpts from the testimony are quoted to present the actual picture:

> Witness Hunt: "To throw her over at any time you have to put your foot up against the boiler head and put all of your strength in your body to get it over." (R. 254.)
>
> Witness Stuckey: "In yard service operating the lever sometimes takes all the strength you have and sometimes the strength of two or three * * *. I have had the fireman and the brakeman come up and help. Hard handling is characteristic of the hand operated gear." (R. 263.)
>
> Witness Diller: "In throwing over a hand reverse lever oftentimes more strength than I have is required. Sometimes I have to move the lever *in four or five hitches.* A foot brace is furnished located about the middle of the quadrant ahead of the seat and I use that in operating the lever. I am not able to handle the lever myself in all cases and have to get the fireman to help me." (R. 271.)
>
> Witness Crum: "In hooking up the lever in passenger service we place the right foot on the foot rest,

which is usually attached to the front end of the quadrant, and brace ourselves and then grasp the lever and unlatch it to the desired position. When you unlatch the lever it pulls first one way and then the other. It rocks. The amount of force with which that rocking motion is accompanied depends largely on the engine and the condition of the valves and the snugness of all the valve joints in the valve gear. * * * In my estimation the rocking motion is caused from the reciprocating motion of the valve. The motion of the valve transmits impulses to the valve gear and from that to the reverse lever in the cab by way of the reach rod." (R. 365.)

Witness Pool: "When I am hooking up an engine, braced with the help of my foot brace, I have had levers fly out of my hands when I would unlatch them, and go to the corner. I have had them give me some pretty hard jerks when I tried to hang on to them. You would unlatch the lever and it would jerk forward that way and would jerk my neck and pretty near make it pop. I have had that happen several times in my experience on locomotives. When I was firing I saw an engineer try to hook up an engine and he was thrown to the floor of the cab and his breath knocked out of him. * * *" (R. 401.)

Witness Larsen: "When I am thus braced, either with my foot on the foot brace or against the boiler head, my experience in handling the lever varies considerably, according to the condition of the gear and weather conditions, or if the cylinder valves are empty of steam. * * * On an R engine, traveling about twenty or twenty-five miles an hour, I went to throw the lever back. There was no indication that there was any unusual strain on the lever, and when I unlatched it it went down into the corner and threw me into the deck from the seat box." (R. 344.)

On the other hand, since the force required to operate power reverse gear is supplied by air or steam pressure, this type of gear requires little strength to operate and can

be handled with one hand. (R. 255, 264, 275, 287, 297, 298, 303.) No difficulty is encountered under the circumstances previously described. (R. 272, 278, 287, 291, 265, 277, 303, 348.) A comparison in the handling of the two types of gear is thus described in the record:

> "When an engine is running and gets up to 55 miles per hour in speed if the engine has one of the Johnson bar type or hand reverse gear you are setting up there in the cab and don't know just exactly the condition of those valves down there and you are a little bit afraid. You say 'I would like to hook her up another notch, but she may take me down in the corner.' With the power reverse gear it is different.
>
> "With the power reverse gear you feel free to hook the engine up or let it down at any time, because there is no danger of being jerked." (R. 1354.)

Another significant difference in the design of the two gears is stated in the report (R. 52):

> "When locomotives are equipped with hand reverse gear any derangement of the valve motion is communicated to the reverse lever in the cab through the lifting shaft and reach-rod. But when power reverse gear is used, the reach-rod terminates at the power reverse gear cylinder, and the only connection to the cab is the rod connecting with the valve which admits air to the reverse gear cylinder."

Some of the "derangements" here referred to and shown in the record are listed below.[1]

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[1] Broken valve range (R. 246); Cut valve (R. 253); Stripped engine (R. 293); Broken reverse lever (R. 296); Loose bolt and quadrant (R. 298); Broken eccentric strap (R. 311); Broken main driving journal (R. 315, 1411); Loose quadrant (R. 318); Broken bolt and latch (R. 344); Broken ring caught in port (R. 373); Broken eccentric rod (R. 383); Broken exhaust ring caught in valve chamber (R. 380, 1414, 1415); Dry valves (R. 390); Driving spring hanger broken (R. 1418); Broken spring equalizer stand (R. 410); Loose pressure plate plug (R. 1420); Broken eccentric crank arm and reverse lever latch (R. 1394); Valves out of square (R. 1401).

In cases where the engineer is attempting to "hook up" or "drop down" the manual gear with such derangements present, a resultant strain is thrown on the lever frequently jerking it from his hands. (R. 282, 1406, 390, 1401, 393.)

At other times the excessive strain thrown on the manual lever from such derangements causes the lever to "jump out of the quadrant" and go to the corner with great force. One of the many accident cases of this kind will serve as an illustration, although more will be said on this subject later. Witness Small testified that on the occasion of his injury:

> "The main driving journal broke and came up and struck the reach rod throwing the lever into back gear and catching my leg against the backboard. The broken parts struck the reach rod and threw the lever into back gear. We were traveling about fifty-five to sixty miles an hour. It broke my leg (causing multiple fractures at the knee joint) * * *. It (the accident) stripped the rods on both sides of the locomotive. When the rod struck that position it flew up and tore the tumbling shaft off the frame and the lever went into the back gear. The lever went back and forth I do not know how many times but it hit me every time." (R. 315, 316.)

On the other hand, with power gear the reach rod terminates at the gear cylinder outside the cab, and the only connection to the cab is the air valve operating rod. In the event of any derangement, improper action or breakage of parts, the control lever in the cab remains stationary. (R. 280, 367, 371, 609, 660, 661, 676, 681, 341, 361, 430.)

Moreover, the stresses and shock from the valve motion is taken up by the cushioning effect of the air in the air cylinder, which resists the pull or push transmitted to the gear cylinder from the valve motion. Thus, as stated by a carrier witness:

"The play and the force [that] is generated by the lost motion of the link motion parts is easily compensated by the cushion of your power reverse gear * * *. The power reverse air cylinder absorbs the force. * * *. With your hand bar or screw reverse gear as soon as anything happens, such as a broken valve or any other parts breaking, it is transmitted immediately to the reverse lever on the cab." (R. 797, 798.)

In one of the cases described of record (R. 275) in which, due to the steam valves sticking (R. 1405, 1406), the manual screw mechanism was torn from the boiler into which it was bolted, permitting hot steam to escape and severely scald the engineer, fireman and brakeman, the witness testified:

"I do not think if we had had the Precision screw (power gear) any one of us would have been hurt on the occasion I described, because it would have torn off outside where the air cylinder is connected to the reach rod. With the manual screw reach rod is run through the valve motion clear through the cab, but with the Precision gear the reach road (valve operating rod) runs from the cab only to the air cylinder." (R. 275.)

Turning now to the accident evidence, the Commission considered evidence from three sources: the testimony of witnesses who were injured or were on or around locomotives when other persons were injured; certain reports (form T.) made by the carriers to the Commission, pursuant to the requirements of the Accidents Reports Act,[1] covering accidents on locomotives in which the reverse gear was involved; and reports of District Inspectors of the Bureau of Locomotive Inspection covering investigation of certain accidents as to which witnesses had given oral testimony.

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[1] U. S. Code, Title 45, Sec. 38; see appendix.

In their case in chief before the Commission, the Complainants called forty-three accident witnesses, (although it would have been possible for them to produce literally hundreds of witnesses to manual gear casualties). The testimony given was intended to be illustrative rather than cumulative, and to cover representative roads. Reference is made below to the accident cases narrated by these witnesses, and, where supplemental reports were received, to the appropriate record references.[1]

To illustrate the severity of the type of injuries sustained in handling manual gear, reference is made to the following cases:

Engineer *Lowe* suffered a multiple fracture to one arm and a fracture to the other, a multiple fracture to one leg, a dislocated shoulder, and cuts about the head and knee. He has never fully recovered from the effects of the injury, his arms being helpless in several respects. (R. 380, 385, 1414.) As stated in the Federal Inspector's report, this accident was caused by the reverse lever throwing him forward against the boiler head and then backwards against the coal gates, where he laid unconscious with a broken reverse lever beside him. (R. 1415.)

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[1] Stone (R. 43, 1399); Hunt (R. 254, 1400); Greenwood (R. 260); Stuckey (R. 264, 1400); Irwin (R. 267); Speas (R. 270, 1401, 1472); Diller (R. 271, 1403); Hurd (R. 275, 1405); Ginder (R. 277); Lawrence (R. 282, 1406); Tanner (R. 286, 1407); Brown (R. 290, 1407, 1462); Flood (R. 294); Snoddy (R. 297, 1408); Southard (R. 306); Price (R. 309); Pearce (R. 311, 1411); Stakeman (R. 313); Small (R. 315, 1411); Howard (R. 318, 1412); Austin (R. 322); Williams (2 cases, R. 329); Domini (2 cases, R. 334); Rudolph (R. 338); Larsen (R. 345); Stringer (R. 347, 1431); Rasmussen (R. 349); Adams (R. 354, 1412, 1484); Underwood (R. 358, 1413); Garman (R. 361, 1413); Crum (R. 366, 1415); Rogers (R. 370, 1427); Inglett (R. 373); Barton (R. 376, 1470); Lowe (R. 380, 1414); Kinnaird (R. 386, 1417, 1456); Paschall (R. 390); Gans (R. 394); Dixon (R. 397); Pool (2 cases, R. 402, 1418, 403); Walker (R. 410, 1418); Young (R. 413, 1420, 1450); Brandt (R. 416, 1437).

Engineer *Small's* left leg was broken above the knee, and he suffered multiple fractures at the knee joint, resulting in a stiff leg, rendering him unable to do any work since the accident, when the reverse lever jumped out of the quadrant and went into back gear, traveling back and forth over the quadrant many times, striking his knee each time. His leg was in splints 6 weeks and in a cast 10 weeks. (R. 315, 316, 1411.)

In Engineer *Calame's* case the lever jumped out of the quadrant, went to the corner, and moved backward and forward over the quadrant, hitting him on the leg and knocking a bone out through his overalls, and twisting the leg so that when he looked at it his toe was where his heel had been. He was confined to a hospital 68 days and off duty about 6 months. (R. 1393, 1394.)

Engineer *Pool's* reverse lever flew back so quickly that he could not see it, grazed his head, cut his glasses off, skinned his face and ear, and cut his knee cap open in two places into the socket of the knee cap. He underwent an operation, lying with his leg in a cast for six weeks, was off duty for three months, and still has a stiff leg. (R. 402.)

Engineer *Brown's* arm was caught when the lever was jerked to the corner carrying him with it between the lever and the drip pipe, breaking both bones of the forearm. He was taken to a hospital where some of the doctors wanted to amputate his arm but it was saved. He was in the hospital about six weeks and off duty about five months. (R. 290, 291.)

Engineer *Greenwood* was ruptured, requiring an operation. Blood poisoning set in, and he had drains in the wound for nine weeks. He was off duty about five months. (R. 260, 261.)

As another illustration of abdominal injuries, when Engineer *Kinnaird* was taking slack he felt what he char-

acterized as an "awful pain" in the region of his groin, and was in great pain all the rest of the day, and had to support the whole part of his abdomen with his hands, illustrating while on the stand the extent of his injury. He was taken to a hospital, and it was found that the muscles and ligaments had been pulled loose from his pelvic bone. (R. 386.)

As to sprained backs and ligaments, among the most common of manual reverse accidents, and doubtless referred to by the court below, as being in the trivial class, in such an injury Engineer *Hunt* testified "in a few minutes the pain got so terrific I had to lie down on the deck of the engine, and they had to take me off and put me in the yard office. From there they took me home." He was off duty 133 days. He returned to work under an agreement with the management that they would put a power reverse engine on his run. (R. 254, 255.)

To show the quantity of casualties and the continuing hazard to which engineers are subjected in the handling of manual gear, the Complainants introduced in Exhibit 13, 219 Form T. reports of injuries on manually equipped locomotives. Included in these casualties were 23 cases of fractured bones, 7 hernias, 108 torn or sprained ligaments, 68 bruises or cuts, 4 dislocations and 9 cases of internal injuries. While the lower court in its opinion (R. 211) and findings of fact (R. 221), speaks of these Form T. casualties as being "minor in character," and in only three cases entailing a disability of more than sixty days, the error of this estimate has been shown elsewhere in this brief.[1] (See pp. 54-55.)

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[1] Of the Form T. manual gear casualties there were six cases of more than 60 days disability, 10 additional cases of disability estimated at 60 days, and 39 additional cases of disability between 30 and 59 days. Moreover, the estimates of disability were minimized, as was shown from the testimony of witnesses relating to the same accidents as were covered by Form T. reports.

As suggested in the foregoing discussion, and stated in the report (R. 56):

> "The operation of the reverse gear is affected by numerous conditions. Chief among these which are reported as causes for accidents referred to elsewhere in this report are the failures due to breakage of parts of the valves[1] or the valve gear,[2] lack of lubrication,[3] the presence on parts of the reverse gear of frost, ice, or snow,[4] and the presence of steam in the cylinders,[5] which may be due either to leaking throttle valve

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[1] When Engineer Young was dropping the lever down preparatory to making a station stop, the left front valve strap fouled on a plug which had worked out of the pressure plate and broke the rocker box and valve yoke, throwing the reverse lever backward and striking his knee a glancing blow, turning him around on the seat box. (R. 413, 1420.) See also the case of Lowe. (R. 380, 1414.)

[2] Engineer Calame was seated in the normal position in a back-up movement when the crank arm came off allowing the eccentric arm to drop and throwing the reverse lever into back motion. The lever latch was broken off. The lever traveled backwards over the quadrant a number of times, striking his leg, breaking his leg and causing the bone to be knocked out through his overalls. (R. 393, 394.) See also cases of Small (R. 315, 411) and Pool (R. 402, 1118).

[3] While Engineer Crum was shoving his lever into forward motion in making a crossing stop, the lever got away from him and came back, smashing him in the right breast and knocking him into the deck of the engine. (R. 366.) The report of the Bureau of Locomotive Inspection disclosed that the primary cause of the accident was insufficient lubrication to the valves which caused an exhaust ring to break and when the lever was pushed to forward motion, the broken ring caught in the port causing the unlatched lever to be forced back violently. The locomotive was equipped with a force feed mechanical lubricator. (R. 1417.) See also cases of Stringer (R. 347, 1431) and Rasmussen (R. 349).

[4] Hostler Domini was instructed to move a locomotive which was frozen up and with the assistance of a helper tried "to loosen it up with the lever." In getting the lever off center he sprained his back and had to be carried home. (R. 334.)

[5] When Engineer Hunt in reversing the lever got the lever just over the center, it went the other way, tearing loose the ligaments in his back. The case was "leaky steam in the steam chest" due to a leaky throttle. (R. 254, 255, 1400.)

or to leaking dry pipe, or to inoperative cylinder cocks or cylinder-cock operating rigging."

The real significance of such erratic action of the manual bar or wheel becomes apparent when it is realized that the engineer must perform his numerous duties in "close quarters" with this dangerous instrumentality. The report states (R. 55):

> "The accidents which have occurred on locomotives equipped with hand reverse gear are attributable to several conditions. On many locomotives the hand lever is located behind the boiler head and at the side of the engineer's seat box. The clearance between the lever and the back board of the cab is frequently very small. In fact, on some locomotives the lever when in extreme backward position extends beyond the back board of the cab, which is cut out to permit the lever to pass. On other locomotives the clearance between the lever and the seat box, as well as between the lever and the boiler head and appurtenances thereon, is very small.[1] Many accidents have occurred, due to engineers and others being caught between the hand reverse lever and the other parts referred to, due to the small clearance.[2] On most locomotives a stop-block or pin is

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[1] R. 247, 251, 252, 257, 259, 263, 266, 271, 281, 285, 286, 288, 290, 291, 295, 296, 298, 299, 300, 302, 304, 305, 309, 313, 314, 320, 321, 325, 326, 329, 331, 332, 336, 337, 352, 353, 354, 358, 361, 363, 364, 373, 381, 382, 385, 387, 390, 393, 400, 401, 405, 407, 408, 410, 412, 415, 416, 417, 418, 420, 1178-1180, 1388, 1389, 1393, 1395, 1407, 1412, 1413.

[2] Stone, injured heel (R. 243); Speas, fractured wrist (R. 270); Lawrence, broken wrist, slivered bones (R. 282); Tanner, fractured leg, bone split 8 inches (R. 286); Brown, multiple fracture of arm (R. 290); Snoddy, multiple fracture of leg (R. 297-8); Pearce, mashed finger (R. 311); Stakeman, fractured leg (R. 313); Small, fractured leg, multiple fractures of knee (R. 315); Howard, bruised hand (R. 318); Austin, strained wrist (R. 322); Williams, sprained wrist, bruised bone (R. 329); Stringer, bruised foot (R. 348); Adams, fractured and cut foot (R. 354); Underwood, injured neck (R. 358); Garman, fractured and mashed finger (R. 363); Crum, bruised chest (R. 366); Rogers, slipped

provided near the ends of the quadrant for the purpose of limiting the travel of the reverse lever, so that it will not come in contact with the cab or the boiler and the appurtenances located thereon. If the stop-block is missing, or, for any reason, fails to function, there is in most cases nothing to prevent the lever from coming in contact with the boiler or the cab, and numerous persons have been injured because this condition exists.[1]

The space in which the engineer must work while operating the locomotive and while in his usual and proper position in the cab, is quite limited. This is especially true on the larger and modern locomotives. On such locomotives he is likely to be struck by the hand lever if, for any reason, it suddenly moves. The fact that the hand reverse lever does suddenly move without a warning to the engineer and from various causes,[2] and that many injuries have resulted from such movements of the hand lever, is clearly established by the evidence.[3]

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vertebrae and dislocation of sacroiliac (R. 370); Lowe, multiple fractures of arms and legs, dislocated shoulder (R. 380); Pool, fractured knee. (R. 402); Walker, hernia (R. 410); Young, bruised knee (R. 413); Brandt, cut knuckles, crushed foot (R. 416); Calame, fractured leg (R. 1393).

[1] R. 296, 416, 417, 311, 354.

[2] R. 241, 246, 247, 250, 253, 254, 259, 272, 279, 281, 283, 284, 288, 293, 296, 300, 303, 305, 311, 314, 317, 319, 321, 328, 337, 344, 353, 373, 383, 386, 390.

[3] R. 243 (injured heel); R. 270 (fractured hand); R. 278 (manual screw and bracket pulled out of boiler, scalding three members of crew, see also 1405); R. 282 (broken and slivered bones in wrist); R. 286 (fractured and split bones in leg); R. 290 (both bones of forearm fractured); R. 298 (fractured leg); R. 306 (fractured ribs); R. 313 (fractured leg); R. 315 (multiple fractures of knee); R. 318 (injured hand); R. 322 (strained wrist); R. 329 (sprained wrist); R. 329 (rupture); R. 354 (foot fractured and cut); R. 358 (injured neck); R. 363 (fractured and mashed finger); R. 366 (bruised breast); R. 380 (both arms fractured, dislocated shoulder, compound fracture of leg); R. 402 (skinned face, fractured knee); R. 410 (hernia); R. 413 (bruised knee); R. 416 (cut knuckles); R. 417 (crushed foot); R. 1374 (fractured leg).

The Commission here refers to cases in which engineers have been injured by being struck by the lever when it unexpectedly "jumps out of the quadrant" or, while handling the lever, have been thrown against the cab, the boiler head or the various pipes or appurtenances in the cab. The following excerpts from the testimony depict what may and does happen when the lever jumps out of the quadrant.

> "On one engine I had a manual bar break off at the fulcrum bolt where it is bolted to the frames and go back and forth from one end of the quadrant to the other, and whipsawed back and forth until we got the engine stopped." (R. 296.)
>
> "When the lever dropped down it went back and forth and back and forth, I don't know how many times, and finally came up and caught nearly half way up." (R. 282.)
>
> "When the rod struck that position it flew up and tore the tumbling shaft off the frame, and the lever went into back gear. The lever went back and forth, I don't know how many times, but it hit me every time." (R. 316.)
>
> "As to the force connected with the lever going to the corner, the weight of the entire valve with the stem is against you plus the weight of your links, as the minute she is unlatched she will drop forward. It goes too quick for you to catch it."

Meeting the contention of the carriers, which was given credence by the court (R. 213), that the injuries attributable to the hand release lever could be avoided if the engineer would be more careful as to where he places his arms and legs while operating a locomotive equipped with manual gear, the Commission in its report said (R. 56):

> "However, in actual operation and with the varied and frequent movements which the engineer is required to make in order to perform his duties properly, he can not constantly keep clear of the reverse gear in the

cab. In theory this might be possible, but in actual practice it can not reasonably be expected. The engineer or other person operating the locomotive is as a matter of actual fact constantly subjected to whatever hazard exists in operating the hand reverse gear, and under many circumstances he has no way of effectively guarding against injury."

The following illustrations from the testimony demonstrate the truth of the Commission's statement.

Engineer Snoddy when approaching a station stop was leaning out of the cab window looking forward so as to gauge his speed and determine where he wanted to stop. He gradually shoved the throttle off and the reverse lever jumped out of the quadrant and went to the corner without any indication whatever, striking him on the leg and dragging him down between the boiler head and the lever where the lever struck his leg every time the engine turned over until he got it stopped, which was a distance of about forty car lengths. Note the following significant testimony:

"By Mr. Morehouse:

Q. What I want to know is this: I want to be fair to you. I understand you to say you put your foot over there to brace yourself. But if you had kept your foot on the floor in front of you or had it placed in any other position to brace yourself there than sticking it in front of the lever, then your foot wouldn't have gotten caught, would it?

A. No; the chances are it would not if you hadn't put it over there. But naturally we have to have a brace of some kind, and *we are not always conscious of just exactly where our feet are going when we are watching something else.*" (R. 298-300.)

Engineer Tanner, while running 45 to 50 miles an hour noticed the engine beginning to kick on the lever as if it was not getting proper lubrication. He did what the carriers recommend under such circumstances, namely,

reached over to turn on the lubricator and in so doing, got in front of the reverse lever. As he did this, the lever jumped out of the quadrant two or three inches. He jumped to save himself, and because of the motion of the engine, was thrown sideways with his shoulders out of the window and his left leg up in the air. At that instant the lever jumped again, and went into the corner catching the calf of his leg, breaking a small bone in the back of the leg and splitting the large bone lengthwise from the ankle joint about eight inches. (R. 286.)

Observe also, as illustrative of this point, that in the serious accidents to engineers Pool (R. 402, 407, 408) and Calame (R. 1393, 1395), the injured men were sitting on their seat boxes in their normal position when the lever jumped unexpectedly out of the quadrant and struck them.

Other accidents occurring when the engineer was actually handling the lever and was struck or otherwise injured by its erratic action, are illustrated by the case of Engineer Crum, who, when attempting to stop for a railroad crossing, applied his brake, kicked down his drop seat and was standing up shoving the lever down to full forward motion. The lever came back and smashed him in the breast and he landed on his feet in the deck of the engine. (R. 366.)

The *opportunity* for the happening of such injuries may be gauged in part by the frequency with which engineers are required to handle the reversing gear. As the Commission states (R. 56):

> "In switching service it is not uncommon for the reverse gear to be moved from 30 to 60 times an hour. In road service the movements are less frequent, but even in that service the reverse gear is moved several times each hour the locomotive is in use. The engineer is liable to be injured not only while making such adjustments, but also on other occasions if the reverse gear moves suddenly and without being touched." (R.

252, 263, 297, 327, 338, 369, 397, 242, 267, 338, 343, 362, 386, 369, 389, 401, 416.)

Turning now to a comparison of the accident evidence as between injuries occurring on manually equipped locomotives and those occurring on power reversed locomotives, the Commission's report states these significant conclusions:

> "In the operation of locomotives many engineers, as well as others, have been injured *by the hand reverse lever.* Some accidents have occurred on locomotives equipped with power reverse which defendants urge would not have occurred, if the locomotives involved had been equipped with hand reverse." (R. 54.) (Italics ours.)
>
> "*Most of the accidents recorded as due to hand reverse gears occurred to employees while handling the reverse gear, whereas only a small percentage of the accidents attributed to power reverse gears occurred to men operating the reverse gear,* the others having occurred to persons on, around, or in the path of the moving locomotive." (R. 55.) (Italics ours.)
>
> "The record shows that during the 5 year period from 1925 to 1929, inclusive, there were 1,116 casualties due to reverse gear. The proportion of such casualties occurring on locomotives equipped with hand reverse gear is illustrated by the fact that of 232 cases occurring in 1929 and 1930 a total of 216 occurred on locomotives equipped with hand reverse gear and 16 on locomotives equipped with power reverse gear.[1] Dur-

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[1] The statistics here set forth were drawn from Exhibits 13 (R. 1420-1434, 1499) and 53 (R. 1499), both exhibits being compiled from identical sources, viz., the Commission's Bureau of Statistics' annual reports, Table 73, Line 6316, denominated "Reverse levers, operating." (R. 1108, 1420.) Exhibit 53 summarizes such casualties for the years 1925 to 1929 inclusive, while Exhibit 13 covers the years 1929 and 1930. Since both exhibits cover the same classification, and are taken from the same source, it follows that the proportion between such manual and power reverse casualties found with respect to Exhibit 13 (216 manual reverse

ing the latter period there were about the same number of locomotives in service with power reverse gear as with hand reverse gear." (R. 54.)

When the Commission spoke of 1116 casualties during said five year period, and referred to the aforementioned proportion thereof occurring on locomotives equipped with hand gear, it definitely had in mind the showing made by Exhibits 13 and 53. From the detail of the accidents shown in Exhibit 13 (R. 1420-1484) it clearly appears that the casualties comprising Exhibits 13 and 53 were, of a class, those resulting from the *handling of the reversing gear* by the engineer while he was engaged in the active operation of the locomotive or train. The casualties comprising Exhibits 13 and 53 do not include the class of accidents arising from other miscellaneous or extraneous hazards of locomotive operation, as to the happening of which the type of reversing gear played only a remote or incidental part.

While, therefore, the court thought that the Commission, in using such statistics, was limiting its consideration of the question of safety to cab stationed employees (R. 214), this assumption was erroneous, for it clearly appears that the Commission was thus expressing simply the correct ratio of accidents directly occurring from the handling of the reverse gear in the cab. This view of the matter is corroborated by the Commission's statement above set forth that "most of the accidents recorded as due to hand

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to 16 power reverse injuries) would likewise obtain to Exhibit 53 (no data being given in Exhibit 53 distinguishing between manual and power reverse accidents). Giving effect to such proportion as to both exhibits, it would appear that there were 981 injuries due to handling manual gear during this five year period. Exhibit 10 discloses that there were about the same number of locomotives equipped with power gear as with manual gear.

As heretofore stated, there is a slight difference in the figures used by the Commission and those appearing from these exhibits as amended. Using the corrected totals of 219 and 12 estimated total of manual gear injuries would be 1055.

reverse gears occurred to employees while handling the reverse gear, whereas only a small percentage of the accidents attributed to power reverse gear occurred to men operating the reverse gear, the others having occurred to persons on, around, or in the path of the moving locomotive."

The fact that the Commission used such ratio in referring to accidents to men in the cab from handling the reversing gear, is no warrant for holding that it disregarded evidence of other types of accidents to persons on, around, or in the path of a moving locomotive equipped with power gear. Indeed, a large portion of its report is devoted to a discussion of the latter type of accidents, and to stating its several conclusions with respect thereto. (R. 56-59.) After fully stating the contentions of the carriers as to such last mentioned class of accidents upon power reversed locomotives, the Commission reached the following conclusions (R. 58-59):

> "Clearly the carriers of this country would not have equipped approximately 29,000 locomotives with power reverse gear, and would not contemplate so equipping practically all new locomotives, if such gears did not contribute to efficiency of locomotive operation, or if power reverse gear is less safe than hand reverse gear. The fault termed 'creeping' causes no accidents and resolves itself largely into a question of proper maintenance. If the power reverse gears are properly maintained, we think 'creeping' to any material extent will be eliminated. As to the ability to detect an obstruction in the valve gear, such as a man's head or arm, by the resistance offered to movement of the hand reverse gear, in time to avoid injury, we do not think such a theory is sound. The matter of power reverse gears becoming inoperative while on the road, due to loss of air pressure, can be taken care of by properly applied and maintained steam connections. As to loco-

motives moving unexpectedly, and crashing through roundhouse walls or into turntable pits, it is common knowledge among railroad men that such movements are not confined to locomotives equipped with power reverse gear but have also occurred on locomotives equipped with hand-operated reverse gear.

Several of the accidents and much of the trouble set forth in the record as occurring on locomotives equipped with power reverse gear occurred on locomotives equipped with what are now obsolete installations. The difficulties encountered on such locomotives cannot be reasonably expected with modern installations."

The evidence supporting these findings, and otherwise refuting the contentions of the carriers upon this subject, was set forth under Point II of our argument, and will not be duplicated here.

The point to be emphasized is that the accident evidence respecting the two types of gears was different in quality and significance, and required rational differentiation. Thus, on the one hand, the accidents shown with respect to hand gears occurred to employees from the handling of the gear in the cab while the locomotive was in actual operation in the yard or on the line of road. On the other hand, the accidents shown with respect to power gears were mainly of a type not attributable to the gear at all (as in the cases of men caught in the valve motion of a locomotive when another employee reversed the engine), or happened under circumstances such as to show that the power gear was involved only indirectly or remotely, and in any event, such types of accidents were shown to be readily avoidable by the enforcement of proper operating rules and the exercise of usual or ordinary care on the part of employees, which is not true of the aforementioned class of manual gear casualties.

That it was the function and duty of the Commission to weigh the conflicting evidence upon this subject, to reason therefrom, and to differentiate between accidents happening under widely different circumstances, cannot be doubted. It is apparent from the very nature of the evidence and the claims of the parties with respect thereto, that the decision with respect to the requested administrative change in the Commission's rules should be left to the tribunal appointed by law and informed by experience. Viewing the record as a whole, there was ample support for the decision and order of the Commission.

CONCLUSION.

It is respectfully submitted that the decision of the District Court should be reversed, and the petition of the carriers dismissed.

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APPENDIX.

STATUTES INVOLVED.

The full text of the Boiler Inspection law (as amended) reads:

AN ACT to promote the safety of employees and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, SEC. 1. [*As amended June 7, 1924.*] [*U. S. Code, title 45, sec. 22.*] That when used in this Act the terms "carrier" and "common carrier" mean a common carrier by railroad, or partly by railroad and partly by water, within the continental United States, subject to the Interstate Commerce Act, as amended, excluding street, suburban, and interurban electric railways unless operated as a part of a general railroad system of transportation. The term "railroad" as used in this Act shall include all the roads in use by any common carrier operating a railroad, whether owned or operated under a contract, agreement, or lease, and the term "employees" as used in this Act shall be held to mean persons actually engaged in or connected with the movement of any train.

SEC. 2. [*As amended June 7, 1924.*] [*U. S. Code, title 45, sec. 23.*] That it shall be unlawful for any carrier to use or permit to be used on its line any locomotive unless said locomotive, its boiler, tender and all parts and appurtenances thereof are in proper condition and safe to operate in the service to which the same are put, that the same may be employed in the active service of such carrier without unnecessary peril to life or limb, and unless said locomotive, its boiler, tender, and all parts and appurtenances thereof have been inspected from time to time in accordance with the provisions of this Act and are able to with-

stand such test or tests as may be prescribed in the rules and regulations hereinafter provided for.

SEC. 3. [*As amended June 7, 1924.*] [*U. S. Code, title 45, secs. 24 and 25.*] That there shall be appointed by the President, by and with the advice and consent of the Senate, a chief inspector and two assistant chief inspectors of locomotive boilers, who shall have general superintendence of the inspectors hereinafter provided for, direct them in the duties thereby imposed upon them, and see that the requirements of this Act and the rules, regulations and instructions made or given hereunder are observed by common carriers subject hereto. The said chief inspector and his two assistants shall be selected with reference to their practical knowledge of the construction and repairing of boilers, and to their fitness and ability to systematize and carry into effect the provisions hereof relating to the inspection and maintenance of locomotive boilers. The chief inspector shall receive a salary of four thousand dollars per year and the assistant chief inspectors shall each receive a salary of three thousand dollars per year; and each of the three shall be paid his traveling expenses incurred in the performance of his duties. The office of the chief inspector shall be in Washington, District of Columbia, and the Interstate Commerce Commission shall provide such legal, technical, stenographic, and clerical help as the business of the offices of the chief inspector and his said assistants may require.

SEC. 4. [*As amended June 7, 1924.*] [*U. S. Code, title 45, secs. 26 and 27.*] That immediately after his appointment and qualification the chief inspector shall divide the territory comprising the several States, the Territories of New Mexico and Arizona, and the District of Columbia into fifty locomotive boiler-inspection districts, so arranged that the service of the inspector appointed for each district shall be most effective, and so that the work required of each inspector shall be substantially the same. Thereupon there shall be appointed by the Interstate Commerce

Commission fifty inspectors of locomotive boilers. Said inspectors shall be in the classified service and shall be appointed after competitive examination according to the law and the rules of the Civil Service Commission governing the classified service. The chief inspector shall assign one inspector so appointed to each of the districts hereinbefore named. Each inspector shall receive a salary of one thousand eight hundred dollars per year and his traveling expenses while engaged in the performance of his duty. He shall receive in addition thereto an annual allowance for office rent, stationery, and clerical assistance, to be fixed by the Interstate Commerce Commission, but not to exceed in the case of any district inspector six hundred dollars per year. In order to obtain the most competent inspectors possible, it shall be the duty of the chief inspector to prepare a list of questions to be propounded to applicants with respect to construction, repair, operation, testing, and inspection of locomotive boilers, and their practical experience in such work, which list, being approved by the Interstate Commerce Commission, shall be used by the Civil Service Commission as a part of its examination. No person interested, either directly or indirectly, in any patented article required to be used on any locomotive under supervision or who is intemperate in his habits shall be eligible to hold the office of either chief inspector or assistant or district inspector.

Within the appropriations therefor and subject to the provisions of this Act, the Interstate Commerce Commission may appoint, from time to time, not more than fifteen inspectors in addition to the number authorized in the first paragraph of this section, as the needs of the service may require. Any inspector appointed under this paragraph shall be so assigned by the chief inspector that his service will be most effective.

SEC. 5. [*U. S. Code, title 45, sec. 28.*] That each carrier subject to this Act shall file its rules and instructions for the inspection of locomotive boilers with

the chief inspector within three months after the approval of this Act, and after hearing and approval by the Interstate Commerce Commission, such rules and instructions, with such modifications as the Commission requires, shall become obligatory upon such carrier: *Provided, however,* That if any carrier subject to this Act shall fail to file its rules and instructions the chief inspector shall prepare rules and instructions not inconsistent herewith for the inspection of locomotive boilers, to be observed by such carrier; which rules and instructions, being approved by the Interstate Commerce Commission, and a copy thereof being served upon the president, general manager, or general superintendent of such carrier, shall be obligatory, and a violation thereof punished as hereinafter provided: *Provided also,* That such common carrier may from time to time change the rules and regulations herein provided for, but such change shall not take effect and the new rules and regulations be in force until the same shall have been filed with and approved by the Interstate Commerce Commission. The chief inspector shall also make all needful rules, regulations, and instructions not inconsistent herewith for the conduct of his office and for the government of the district inspectors: *Provided, however,* That all such rules and instructions shall be approved by the Interstate Commerce Commission before they take effect.

SEC. 6. [*U. S. Code, title 45, sec. 29.*] That it shall be the duty of each inspector to become familiar, so far as practicable, with the condition of each locomotive boiler ordinarily housed or repaired in his district, and if any locomotive is ordinarily housed or repaired in two or more districts, then the chief inspector or an assistant shall make such division between inspectors as will avoid the necessity for duplication of work. Each inspector shall make such personal inspection of the locomotive boilers under his care from time to time as may be necessary to fully carry out the provisions of this Act, and as may be consistent with

his other duties, but he shall not be required to make such inspections at stated times or at regular intervals. His first duty shall be to see that the carriers make inspections in accordance with the rules and regulations established or approved by the Interstate Commerce Commission, and that carriers repair the defects which such inspections disclose before the boiler or boilers or appurtenances pertaining thereto are again put in service. To this end each carrier subject to this Act shall file with the inspector in charge, under the oath of the proper officer or employee, a duplicate of the report of each inspection required by such rules and regulations, and shall also file with such inspector, under the oath of the proper officer or employee, a report showing the repair of the defects disclosed by the inspection. The rules and regulations hereinbefore provided for shall prescribe the time at which such reports shall be made. Whenever any district inspector shall, in the performance of his duty, find any locomotive boiler or apparatus pertaining thereto not conforming to the requirements of the law or the rules and regulations established and approved as hereinbefore stated, he shall notify the carrier in writing that the locomotive is not in serviceable condition, and thereafter such boiler shall not be used until in serviceable condition: *Provided*, That a carrier, when notified by an inspector in writing that a locomotive boiler is not in serviceable condition because of defects set out and described in said notice, may, within five days after receiving said notice, appeal to the chief inspector by telegraph or by letter to have said boiler re-examined, and upon receipt of the appeal from the inspector's decision the chief inspector shall assign one of the assistant chief inspectors or any district inspector other than the one from whose decision the appeal is taken to re-examine and inspect said boiler within fifteen days from date of notice. If upon such re-examination the boiler is found in serviceable condition, the chief inspector shall immediately notify the carrier in writing, whereupon such boiler may be put into service without further delay; but if the re-examination of said boiler sus-

tains the decision of the district inspector, the chief inspector shall at once notify the carrier owning or operating such locomotive that the appeal from the decision of the inspector is dismissed, and upon the receipt of such notice the carrier may, within thirty days, appeal to the Interstate Commerce Commission, and upon such appeal, and after hearing, said Commission shall have power to revise, modify, or set aside such action of the chief inspector and declare that said locomotive is in serviceable condition and authorize the same to be operated: *Provided further,* That pending either appeal the requirements of the inspector shall be effective.

SEC. 7. [*U. S. Code, title 45, sec. 31.*] That the chief inspector shall make an annual report to the Interstate Commerce Commission of the work done during the year and shall make such recommendations for the betterment of the service as he may desire.

SEC. 8. [*U. S. Code, title 45, secs. 32 and 33.*] That in the case of accident resulting from failure from any cause of a locomotive boiler or its appurtenances, resulting in serious injury or death to one or more persons, a statement forthwith must be made in writing of the fact of such accident, by the carrier owning or operating said locomotive, to the chief inspector; whereupon the facts concerning such accident shall be investigated by the chief inspector or one of his assistants, or such inspector as the chief inspector may designate for that purpose. And where the locomotive is disabled to the extent that it can not be run by its own steam, the part or parts affected by the said accident shall be preserved by said carrier intact, so far as possible, without hindrance or interference to traffic until after said inspection. The chief inspector or an assistant or the designated inspector making the investigation shall examine or cause to be examined thoroughly the boiler or part affected, making full and detailed report of the cause of the accident to the chief inspector.

The Interstate Commerce Commission may at any time call upon the chief inspector for a report of any accident embraced in this section, and upon the receipt of said report, if it deems it to the public interest, make reports of such investigations, stating the cause of accident, together with such recommendations as it deems proper. Such reports shall be made public in such manner as the Commission deems proper. Neither said report nor any report of said investigation nor any part thereof shall be admitted as evidence or used for any purpose in any suit or action for damages growing out of any matter mentioned in said report or investigation.

SEC. 9. [*U. S. Code, title 45, sec. 34.*] That any common carrier violating this Act or any rule or regulation made under its provisions or any lawful order of any inspector shall be liable to a penalty of one hundred dollars for each and every such violation, to be recovered in a suit or suits to be brought by the United States attorney in the district court of the United States having jurisdiction in the locality where such violation shall have been committed; and it shall be the duty of such attorneys, subject to the direction of the Attorney General, to bring such suits upon duly verified information being lodged with them, respectively, of such violations having occurred; and it shall be the duty of the chief inspector of locomotive boilers to give information to the proper United States attorney of all violations of this Act coming to his knowledge.

SEC. 10.*

[*Act of March 4, 1915, amending act of February 17, 1911.*]

SEC. 1. That section two of the act entitled "An Act to promote the safety of employees and travelers upon railroads by compelling common carriers engaged

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* Sec. 10 repealed June 7, 1924, 43 Stat. L. 659.

in interstate commerce to equip their locomotives with safe and suitable boilers and appurtenances thereto," approved February seventeenth, nineteen hundred and eleven, shall apply to and include the entire locomotive and tender and all parts and appurtenances thereof.

SEC. 2. [*U. S. Code, title 45, sec. 30.*] That the chief inspector and the two assistant chief inspectors, together with all the district inspectors, appointed under the Act of February seventeenth, nineteen hundred and eleven, shall inspect and shall have the same powers and duties with respect to all the parts and appurtenances of the locomotive and tender that they now have with respect to the boiler of a locomotive and the appurtenances thereof, and the said Act of February seventeenth, nineteen hundred and eleven, shall apply to and include the entire locomotive and tender and all their parts with the same force and effect as it now applies to locomotive boilers and their appurtenances. That upon the passage of this Act all inspectors and applicants for the position of inspector shall be examined touching their qualifications and fitness with respect to the additional duties imposed by this act.

SEC. 3. That nothing in this act shall be held to alter, amend, change, repeal, or modify any other Act of Congress than the said Act of February seventeenth, nineteen hundred and eleven, to which reference is herein specifically made, or any order of the Interstate Commerce Commission promulgated under the safety appliance Act of March second, eighteen hundred and ninety-three, and supplemental Acts.

SEC. 4. That this Act shall take effect six months after its passage, except as otherwise herein provided.

PERTINENT EXCERPTS FROM THE ACCIDENT REPORTS ACT.

[May 6, 1910.]

AN ACT requiring common carriers engaged in interstate and foreign commerce to make full reports of all accidents to the Interstate Commerce Commission, and authorizing investigations thereof by said Commission.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, [*U. S. Code, title 45, sec. 38, 36 Stat. L., 350.*] That it shall be the duty of the general manager, superintendent, or other proper officer of every common carrier engaged in interstate or foreign commerce by railroad to make to the Interstate Commerce Commission, at its office in Washington, District of Columbia, a monthly report, under oath of all collisions, derailments, or other accidents resulting in injury to persons, equipment, or roadbed arising from the operation of such railroad under such rules and regulations as may be prescribed by the said Commission, which report shall state the nature and causes thereof and the circumstances connected therewith: *Provided,* That hereafter all said carriers shall be relieved from the duty of reporting accidents in their annual financial and operating reports made to the Commission.

SEC. 2. [*U. S. Code, title 45, sec. 39.*] That any common carrier failing to make such report within thirty days after the end of any month shall be deemed guilty of a misdemeanor, and upon conviction thereof by a court of competent jurisdiction shall be punished by a fine of not more than one hundred dollars for each and every offense and for every day during which it shall fail to make such report after the time herein specified for making the same.

SEC. 5. [*U. S. Code, title 45, sec. 42.*] That the Interstate Commerce Commission is authorized to prescribe for such common carriers a method and form for making the reports hereinbefore provided.